THE HOME AND SCHOOL REFERENCE WORK

A Library of

Practical, Authoritative Information

Drawn From Every Department of Human
Knowledge

Prepared by more than 200 of the World's
foremost educators

Volume VIII

PERPETUAL ENCYCLOPEDIA CORPORATION

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Today and Tomorrow

Think truly, and thy thoughts
Shall the world's famine feed;
Speak truly, and each word of thine
Shall be a fruitful seed;
Live truly, and thy life shall be
A great and noble creed.
—*Horatius Bonar.*

The Outlook. The man of today stands upon a higher eminence, has a broader outlook, possesses greater resources and is better trained for life than any who have preceded him. He is the heir of all the ages. He stands upon the shoulders of all past generations, and all they have gained through their struggles for liberty, all their achievements in science, art, literature, government, education and commerce, are his.

With this great inheritance comes a correspondingly great responsibility. Civilization advances because men learn from the experience of others. We are living in age of both theory and practice, and the theory that cannot be practically applied is of little value.

The present is placing emphasis on the *how* more than on the *why,* and the man who *knows how* is the man whose services are in demand. Such a man is never in want of a position.

"This age of the world wants persons who can do things not only well but quickly. Those who cannot combine both qualities will be pushed to the rear in the struggle for existence."

All efforts today are directed towards teaching men how to live in a higher, broader, nobler way than they ever lived before.

These efforts are along practical and moral lines. The great aim of education today is to fit boys and girls to become useful members of society, not only by storing their minds with useful knowledge and inspiring them with high ideals, but by training them in some gainful occupation as well.

For many years the German Government has given careful attention to vocational training, and the present demand for vocational schools in this country shows that we are rapidly falling into line. The Department of Agriculture is assisting farmers to improve their crops and their live stock; medical colleges are preventing disease; and everywhere business methods have for their purpose efficiency.

TO PARENTS

"To make a life is more than to make a living."

Responsibility. Now my dear parents, let us have a little chat together.

Someone has said that the bringing up of boys and girls is the supreme work of the day. You naturally desire for your children the best things in life. You wish them to become noble men and women, a blessing in the home and a power for good in society. Indeed, you should consider it obligatory upon you that these goals be reached.

"No man liveth unto himself." Everyone contributes his mite to the making of society and of the state. Whether that contribution shall be for good or ill depends very largely upon the home training.

You are responsible for placing before your children such advantages and surrounding them with such home influences as will make them useful citizens. If the home life is pleasant, if within the home there is an atmosphere of sympathy between parents and children, and, above all, if there is perfect confidence and understanding, the boys and girls will seldom be attracted away by outside influences.

The Time is Short. In the rush of our American life, the years of training are few, and therefore the time is doubly precious. Are you doing all you can for your boys and girls?

Do you take time to answer their questions and to assist them in solving the problems of life which they find perplexing?

Do you lead them to feel that their problems are your problems too?

The Home Should Supplement the School. Do you realize that only a small part of education is obtained at school?

The school has the children only a few hours a day for five days in the week, and at most for only nine or ten months in the year, and more than one-half the schools are restricted to a school year of seven or eight months.

Are your children interested in their school work?

Are they gaining mental discipline at the same time that they are acquiring knowledge?

Remember that the discipline gained, that is, the power to achieve, is of greater value than the knowledge acquired. In other words, it is that power which enables your boys and girls to use their knowledge in a practical way. Without this their knowledge will be of but little value to them.

Do you often wish that you had some work of general information to which they could turn and find just the information desired?

Necessary Helps. The Home and School Reference Work has been prepared by a company of experienced educators, who realized fully the needs of your boys and girls in this respect.

It contains the information they need.

It is written in a clear and simple style.

The subjects are logically arranged.

The illustrations are in themselves an education.

The Plan and Method volume contains numerous plans and outlines on school subjects that will be of the greatest assistance to them in training them in correct habits of study and research. With this work in their hands, they can find for themselves, without assistance, the information necessary to keep them interested in their school work, and that will at the same time extend their knowledge of the subjects studied far beyond what is given in the textbooks.

One great purpose of this work is to unite the home and the school in preparing the boys and girls today for citizens in that great tomorrow which they are about to enter. That tomorrow will have higher social and moral standards, a broader outlook and keener competition than we experience today. Its watchwords will be integrity and efficiency. Are you doing all you can to prepare your children to meet these demands?

TO THE YOUNG MAN AND YOUNG WOMAN

In that grand tomorrow the young men and young women of today are to play a conspicuous part. They are to be the inventors and discoverers, the merchants and bankers, the agriculturists, the statesmen, the writers and the leaders in great social reforms. Their thoughts and achievements will mold the opinion of society and shape the destinies of the nation.

Are you to maintain your position in the front rank of the procession? We believe that you are, but the issue is in your hands.

Do you lack knowledge or skill? If so, you have only to improve your spare time to supply the deficiency.

The late President Harper of the University of Chicago was of the opinion that the average man wasted enough time every year to enable him, if properly employed, to learn a foreign language.

Be his opinion right or wrong, we must admit that all of us squander more or less of our time and energies. Since we are responsible members of society, we are under obligation to make the wisest and best use of all resources at our disposal.

He who lacks knowledge is unable to see clearly and solve quickly the problems connected with his vocation, and therefore requires more time and expends more energy than would otherwise be necessary.

He who lacks skill requires two minutes to accomplish what with the requisite skill he would do in one. The minutes multiply and soon hours of wasted time are charged against one lacking skill.

This lack of skill is seen in all the vocations of life. It causes the farmer to waste time in tilling his soil and harvesting his crop. Moreover, ground not properly prepared returns a poor yield in both quantity and quality. Loss of time and loss of profit are chargeable to the farmer's lack of skill.

The unskilled mechanic requires a long time to make an inferior article. He must always work for a low wage and on work of an inferior grade.

The professional man who lacks skill is a bungler whose errors usually exceed his contributions to the benefit of society.

A liberal education is within the reach of everyone, whatever his position. Many, if not most, of the leading men and women of today are self-educated.

The heights by great men gained and kept
Were not attained by sudden flight,
But they, while their companions slept,
Were toiling upward in the night.
—*Longfellow.*

Have you been deprived of such opportunities to attend school as you desired? What others have accomplished you can do. What is required is determination and persistent effort. An hour a day, or even less, spent in systematic reading or study will in time enable you to gain a liberal education.

You wish to take your part in solving the problems of the future; you wish to contribute your share to the uplift of society and to exert an influence that will make your presence desired, even longed for.

Build today, then strong and sure,
With firm and ample base;
And ascending and secure
Shall tomorrow find its place.
—*Longfellow.*

THE HOME AND SCHOOL REFERENCE WORK is so planned as to enable you to obtain the greatest amount of information in the shortest possible time. Within these volumes are comprehensive treatises on literature, history, government, business and finance, the various branches of physical science and many other subjects. To study any of these systematically, follow the order in the Topical Index. In the possession of THE HOME AND SCHOOL REFERENCE WORK, the editors wish you to feel that you have at hand a library of useful information, and the more you use the volumes the more valuable they will be to you.

TO THE TEACHER

The teacher, after the father and mother, exerts the greatest influence and shares the greatest responsibility in determining the child's future. Those who do not realize this responsibility and the importance and dignity of teaching as a profession should never enter the schoolroom as instructors.

Never before in the world's history has there been such an awakening on education as now. Social and business relations are becoming so complex and competition so keen that all realize that the methods and courses of study of the past

are not sufficient for the present. Better methods and a broader scholarship are demanded of the teacher than ever before. And this is for the advantage of the teacher as well as the pupils, since it means less competition and higher salaries for those who foresee these demands and prepare in advance to meet them.

Better Knowledge of Subjects. Nearly three-fourths of the teachers who fail do so because of their lack of knowledge of the subjects they are required to teach. The up-to-date teacher realizes that her textbook is only a text, and that she must supplement it with collateral information if she is to keep the pupils interested in their work.

That she may supply such information she should have at hand an up-to-date authentic work of ready reference, and THE HOME AND SCHOOL REFERENCE WORK meets this need better than any other work.

The interesting way in which subjects can be developed by use of THE HOME AND SCHOOL REFERENCE WORK is well illustrated by topics relating to the Panama Canal.

You will find under the general topic *Panama Canal* a full account of the canal itself, its plan of construction, its history, the problems of engineering, transportation, politics, sanitation and finance, and a discussion of the geographical and commercial importance of the enterprise. But this should be only the beginning of your study. You should know something of other great canals, as the Suez and the Sault Ste. Marie. Under the topic *Locks* you will find a discussion of the nature and types of canal locks.

Following another avenue of thought, you are led to read the article on *Travel and Transportation*, in which you will find an absorbing story of the evolution of transportation from the time of primitive man down to the last word in airships, electric vehicles, automobiles, steam engines and steamships. Under *Steamship* you will find a full description of the latest marvel of ship construction, the *Imperator*.

Studying the political aspect of the subject you will find profitable reading on the general subject *Treaty*. The Hay-Pauncefote Treaty is discussed individually, and the Hay-Herran Treaty in connection with *Panama, Republic of*. Other closely-related subjects are *Colombia, Monroe Doctrine* and *International Law*.

Exploring another phase of your topic, you begin with *Sanitation* and proceed in turn to *Yellow Fever, Malaria* and *Mosquito*, and in each of these discussions you will be surprised at the wealth of information science has gained in the last decade. Two other subjects which could be read very profitably in this connection are *Wireless Telegraphy* and *Tides*. Both are presented with clearness.

In the plan for the study of Kansas in the chapter on *Geography* you will find an illustration of the use that can be made of THE HOME AND SCHOOL REFERENCE WORK in the study of that subject, and it provides ample material for teaching other subjects in an equally interesting manner.

Our Purpose

Many teachers are familiar with books on psychology and pedagogy, they have attended normal schools and considered school problems at institutes. Yet there is a drag in their work.

Are you in that class?

These volumes of Normal Methods are intended to help you. We have arranged material that will assist you in teaching the branches required in your school.

Our main purpose, however, is to inspire you with higher ideals, pertaining to your profession. You will only rouse to a realization of the importance of your work, the great mission in which you are engaged as you become acquainted with the real, live problems of education today. When you read of the new methods, learn what others are doing, if your heart is in your work there will awake in you, the same enthusiasm that is urging others on, a great purpose will form in your mind, every detail of your work will be invested with new meaning.

BEFORE SCHOOL LIFE BEGINS

BEFORE SCHOOL LIFE BEGINS

There is a sight all hearts beguiling,
A youthful mother to her infant smiling,
Who with spread arms and dancing feet,
And cooing voice, returns its answer sweet.

A Golden Truth

In recent years, a most important truth has been forcing itself on the consciousness of thinking men and women: As the flower is responsive to every current of air that plays around it; so is the mind of the child responsive to all the influences of home, at a period of life far earlier than we have thought possible. The child's training begins almost with its first cry. As a consequence, thoughtful people now see that the first six years of life are the most important of all in the way of training. Whether parents realize it or not, during those years the plastic mind of the child is setting to the mold of its daily life. Traits of character are forming that will inevitably influence it in after life. We have adopted the form of a very transparent story to impress this truth.

Baby John Smith

This is a brief account of Kindergarten Methods in the training of Baby Smith. He was in no ways different from an ordinary healthy child, even such as bless your own home, but his mother, Mrs. Helen Smith, influenced by her brother, Professor Brown, who held the chair of psychology in their home college, believed it was her duty to play with him the foolish, little fumbling plays of babyhood, in accordance with suggestions found in Froebel's writings. His father, Mr. Henry Smith, was a sympathetic on-looker, willing to assist in the educative process, frankly confessing, however, that he knew nothing about it. It is believed that mothers generally, will profit by this account.

The Start

For a few weeks following his arrival, Baby Smith nursed and slept and slept and nursed as all well ordered babies should. His father and admiring friends and relatives thought that was as complete a schedule as baby needed; but when he was only three months old, his mother announced that it was none too

early to give him some assistance to develop his mental nature.

"But how?" began his astonished father.

"It is this way," interrupted the Professor. "Nature has adopted play as the means whereby to develop the physical, mental, and moral nature of children. Your first duty as parents, then, is to guide this play instinct. Help him through his play to come to a knowledge of self. The true aim of education is to incite and guide that self-activity of the child."

The mystified father had no clear idea of the meaning implied in this learned remark, and so he kept still. Mrs. Smith, however, produced a number of differently colored, soft, woolen balls that constituted Froebel's first gift and recalled various little games and songs that the founder of the kindergarten system had prepared. Here was a chance for the Professor to intervene again.

Froebel's Work

"We need not say," he began, "that Froebel invented this system; what he did was to organize, systematize, and give reasons for the instinctive plays and baby songs that mothers always have employed. Nature prompts the little child to perform all sorts of fumbling motions to develop his muscles and help him to a dim understanding of the strange world he has entered. The mother responds to this by her baby songs and baby plays. What is needed is to see the reasons back of all this and help nature along."

Accordingly, the mother began using the red ball as baby's first plaything. She chose the red ball because that is the color that most readily attracts attention. With the little fellow sitting on her lap, she would swing the ball gently to and fro by its string singing "Here and there," or "To and fro," or suiting the action to the word, "Up, down," "Around and around," or "Jump, ball, jump," baby's eyes following the movement. Of course, this game was played very gently and only a few moments at a time.

"Why not give him the ball and let him play with it?" ventured Henry one day.

"Not good form at all," laughed the mother. "I must play with him, because I want to be his chum all through babyhood and boyhood, and so I begin right now."

How Baby Learns

"Besides," continued the Professor, "imitation is the child's method of learning. By seeing the better, more correlated movements that Helen makes, he

UP AND DOWN

will more rapidly acquire them himself. And then the singing is very important. Instinctively, mothers the world over sing to babies little foolish songs; singing is always soothing, and the little one associates it with a mother's love."

"I suppose there is no objection to my taking a hand," observed Henry. So he picked up the blue ball and commenced to swing it before the baby's eyes.

"You are not going at it right," protested Helen. "In the first place, baby is tired now and you should only play with him when he is ready for play. Besides, look at the color of that ball! Do

not give him that for a week or so yet. Let him first associate the color red with the red ball."

It was not for a week or so later that his mother substituted the blue ball for the red one. By that time, Baby Smith could imitate his mother's motions, and now and then his tiny fingers grasped the ball, and he was delighted when it was gently pulled away. Helen was certain he wore a puzzled look when the blue ball was placed in his hands. Here was a strange new fact for him. Red was not the only soft, fuzzy thing in the world! The blue ball was followed by the yellow one, then the three were played with together. Care was taken to use the color name very often, talking and singing of "Red Ball," "Blue Ball" or whichever was being used at the time. Since these are the principal colors, the others, orange, green and violet, were not used till a later period.

As usual, it was the Professor who gave the full explanation.

"Color," explained he, "is the principal means by which, as far as sight is concerned, we distinguish different objects. It is important, then, that we aid the young child to develop his sense of color. Not until that has been done can his mind develop rapidly. But the three primary colors are the important ones, so do not confuse his mind with the finer shades of color until the preliminary step has been taken. For many reasons, it is well to impress on the child the name of the color, since you then are assisting him to grasp ideas."

The Kicking Game

"I gave baby a lesson in the kicking game," said Helen, as they sat on the front porch.

"The—er—beginning football a little early?" queried Henry.

"The kicking game," resumed Helen, "is nothing in the football line. I know that it is necessary for him to exercise his muscles, so I just lay him down on the bed, of course nothing on him, and press my hands against his feet and let him kick them while I sing some little song to him, something descriptive of his motions, of course baby talk like 'Up and down, in and out.' "

"I imagine my mother just let me kick any old way I wanted to," mused Henry.

"But Froebel says," resumed Helen, "that all these steps are necessary. He must have something to kick against, and you must play it with him, and you should sing some simple song. Why are all these things necessary?" This last query was addressed to her brother, who thoughtfully stared at the moon before answering.

What Is Really Sought

"We must constantly bear in mind Froebel's central thought," he began, after his inspection of the moon. "Nature sets the little limbs in motion, primarily for exercise, let us say, but, directed, that simple motion may be made the means of laying the foundation of one of the deepest lessons of life. This is the great value of all of his kindergarten exercises. Froebel takes the instinctive actions of the young child, and enables us to—"

"But about the kicks, Professor?" put in Henry.

"Oh, yes, well, all through life we need to exercise self-confidence, and exert ourselves to overcome obstacles. Sister places her hands for the little feet to kick against. An idea of resistance to be overcome is born in the mind of the child. It is of course infantile, but it is a beginning just the same. It is the germ of a great idea, as in the acorn is the germ of a great tree. In every way this idea is to be strengthened."

"And my singing and playing with him?" queried Helen.

The Germ of Self-Confidence

"A double purpose, sister," resumed the Professor. "In the first place, it is all important that your little boy should associate you in his play as his playmate, his associate, his chum. Let that feeling be strengthened in every way. Then

again, he soon learns that he has nothing to fear from you, the voice that has been singing to him for weeks is sounding in his ears. Now, of course, it may seem to you all this is far fetched. Don't you know the beginning of anything and everything that makes life worth living was relatively as feeble, as little to be noticed as this? Assist the child to come to himself in this respect. This germ expands into the daring and venturesome feats of boyhood, exploring caves and ravines, climbing trees and mountains, roaming through fields and forests; finally, we have the explorer on his way to the Poles, the inventor that sails in the air, the astronomer that reads the riddle of the stars."

"Play the game, Helen!" fervently exclaimed Henry.

"There are many more new games," smiled Helen. "I may tell you how I get along with still another tomorrow."

"But remember," said the Professor, rising, "these are not new games. They are simply new ideas concerning, and new directions for playing. We are now learning to help nature by directing the plays of childhood."

The Falling Game

It was Henry who led the way to the porch the next evening.

"I have been thinking all day that in a few years baby should be a great credit to 'father.' I shall probably dodge responsibilities in favor of Helen, but I am beginning to think I ought to get busy also. Can't I catch on to any of these games?"

"Your time will come later, sir," laughed Helen. "But I have been thinking over the falling game. I suppose mamma played it with me, but you don't know how much new meaning Froebel puts into it."

"Falling game, is it?" mused Henry. "Sounds like something in the athletic line. What's the idea?"

"As usual, it takes us two to play it. I lay baby on the bed, place my hands under his back, raise him about half way up, and let him fall back on the bed, singing as I do something about "Up comes baby" and "Down goes baby—"

"Sure enough!" ejaculated Henry. "I presume we all played that when we were youngsters, but what deep significance have they found in it?"

"You answer, brother."

"Does baby seemed scared when you let him go?" queried the Professor.

"DOWN GOES BABY"

"He did at first," admitted Helen, 'but now he seems to enjoy it."

"You should be able to put those two facts together so as to draw your own conclusions."

"But I am not a genius like Froebel," explained Henry.

So the Professor began his reply:

Faith in Others

"Baby was naturally frightened when he first felt himself falling and fear showed in his face. But his mother bending over him and her singing—though he didn't understand a word she was saying—some way assured him that it was all right. So it was not long before he felt safe and was ready to enjoy himself. But—and here is the lesson—"

"Listen!" enjoined Helen, as Henry repressed a vigorous yawn.

"You are nurturing and helping develop the germ of faith, confidence in the wisdom of others, in this case the mother. But if you will only stop to consider matters, faith is a quality that one needs all through life. All who work for future results under present discouraging circumstances must have the assurance of faith that things will come out all right.

"As for confidence, well, what would the world do if we did not have confidence in others? Now, mothers have been playing that game with children for ages. Do you not think Froebel was right in asserting that this was an instinctive act on the part of the mother to meet a hunger, so to speak, of the infant? A hunger for development. In countless ways, we can detect a meaning in the instinctive play of mother and child. As for the singing—"

"I found something in one of my books," interrupted Helen, "on that point. I want to read it." Henry indulged in an unseen smile as she began; he thought the Professor would just as soon have done all the explaining.

The Mother's Voice

"Why does the intuitive mother love to talk and sing to her child long before he is able to understand words or catch melodies? Why does Froebel insist that each of his little games shall be accompanied by word and song? Because," continued Helen, "it is through the frequent association of words with objects and acts that the child comes to connect sounds with ideas and it is through imitating these sounds that he becomes a language using being—through prattle and song the child learns to know his mother's voice, and this voice calms and attracts him though he understands not a word of what is said. Love for his mother's voice renders him at a later stage of development more obedient to its commands more susceptible to its appeals."

"These games seem to be one-sided," protested Henry. "Where does the father come in? Don't I have anything to do?"

"You will have abundance of opportunity when baby is a few years older. The first few years of life belong more especially to the mother, how anxiously she should improve her opportunity! But the time will soon come when the father, also, should become his chum, his confidant, and happy is the father that is such!"

"It is time for baby to have the second gifts," concluded Helen, as they went into the house.

Ideas as to Form and Size

The next day Froebel's second gifts arrived, the wooden spheres, cubes and cylinders. Baby's introduction to the sphere was interesting. His mother had been rolling the soft ball to and fro before him. She suddenly put the wooden one in its place. The look on his little face plainly showed that he was puzzled to account for the noise it made; it was evidently a great mystery to him, which was increased when he was allowed to hold it. Here was something hard and heavy, not light and soft, ideas that he had heretofore associated with a ball. All this was strange to his little mind. The cube was another wonder. Placed on the floor, it did not move away from him when he tried to grasp it. The cylinder was different still.

"Relatively," explained the Professor, "the mystery presented to his mind is as great as is the case with us when confronted with some puzzling fact in natural science. Just as we advance in learning and power to understand and apply our knowledge, so will he. This is the faint beginning. Through his plays with these gifts, we assist nature to develop mental powers."

"I suppose the singing keeps up—what do you sing now? 'Hard ball, hard ball?' "

Around and Around

"Not this time," said Helen, in reply to Henry's question. "I want him to form ideas as to motion. So I take a plate and let the ball roll round in it as I incline the plate, and I sing 'Around, around, happy now am I.' The whole song is in this book." She indicated one of Froebel's books in her lap. She continued in a confidential tone, "I am going to sing some nursery rhyme to baby in every game we play, so that my voice will always bring him a sense of love and security."

"I sure will have to brush up on my singing," observed Henry. "But I must say, I do think baby notices things. Mr. Black was in the store today and of course had to tell me all about how smart their baby is. I don't believe he is in it with John, and he is a month older."

"Well, you know the old saying about parents and their children," observed the Professor. "As I am an old bachelor, I am, of course, just the one to tell parents all about it. Sister is going at it right, because she is assisting nature. You see these little fellows wake up with a mind just at the starting point. We grown-ups are apt to think the baby starts with an assorted stock of our ideas. We are mistaken. He has to form ideas as to color, shape, and qualities. You are helping him with these gifts, and the right way is to connect the sensations received through the sense of touch and sight with words to describe the object, and this by means of song, the voice of love."

"Here is where I take hold. I will help him build houses and barns and churches with his blocks."

"Not yet!" protested Helen. "You mean well, but you have not studied the matter. We must let him get acquainted with his blocks first, develop ideas of form and shape, and make a beginning in piling them up and building things himself. As brother says, you must assist, not do the thing yourself."

Two Sorts of Education

"Declined with thanks," sighed Henry.

It was now the Professor's turn. "Education is of two sorts; the sugar-plum and the climbing-hill varieties. The first proceeds on the theory that you must make it easy for little folks, help them over all the hard places by doing it for them. Some teachers seem to think that is what they are for. The climbing-hill idea is to let the little folks do things themselves. You must simply direct their activities, giving them a few pointers here and there. So, sister is right."

"And I will have to wait for some more important game," concluded Henry.

"Well, as to importance, perhaps not. In construction work, we find the highest achievements of man. Look at our skyscrapers, bridges, imposing structures of all kinds. These are the present day triumphs of a development that began in the infancy of the race, in just such childish ideas as those that blocks arouse in babies' minds. Playing with blocks is one of the most important kindergarten games. So, play the game with him, sister, and thus help nature to rouse to activity some higher faculty of the mind, but, remember, it is simply a faint beginning now."

Tic-Tac-Toc

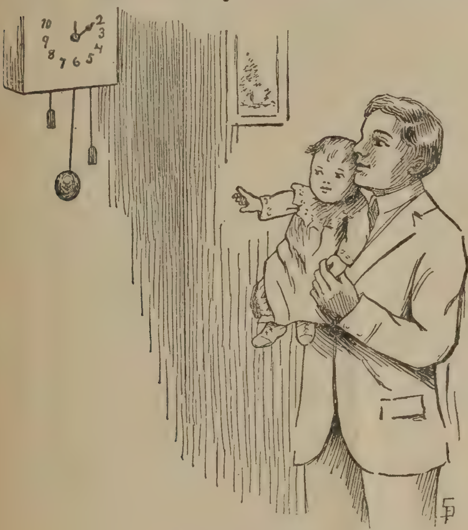
But Henry had his brief hour of triumph. Carrying baby across the room, he noticed the little fellow staring at a swinging pendulum. So he stopped before the clock and commenced to swing his hand back and forth in front of it while saying "Tic-toc—tic-toc," to the evident delight of Johnnie. And then Helen arrived on the scene.

"Playing the pendulum game, Henry?"

"I hadn't the remotest idea I was taking a hand in any game," he protested. "I saw the youngster was pleased with the clock, and I—er—'assisted nature,' you know."

"But, sir, this is a game. I haven't said 'play' yet. But now that you have blundered into it, I will tell you how it is done."

Taking the baby, she stood before the clock and gently swung the baby's arm in imitation of the pendulum, singing "Tic-tock, tic-tock, hear the clock." She turned to Henry. "This is one of the easiest games to play. The baby may sit in your lap or stand upon the table. The arms must be free so that you can swing them like a pendulum. We should, however, take first one arm and then the other. Now that you have started the



TIC-TAC-TOC

game, we will hang one of the little balls so we can play that it is a pendulum. But be sure to say 'Tic-tac-toc' as you play it. Before long, by simply saying these words, baby will begin to swing his arms, and, by the way, your watch will come in handy now. When he hears the tics he will be reminded of the clock."

"Nothing very startling in all this. Really I feel relieved. But—wait—any deep moral lessons involved?"

"Indeed there are. But baby must go to sleep now. We will talk it over with brother tonight."

The Pendulum Game

"Ah, the pendulum game," began the Professor. "You are getting along fast. But play the game! Lessons involved? Yes, one or two of the greatest worth. (As the Professor was affectionately rubbing his nose they knew something of importance was due.) First, the mysterious clock makes a direct appeal to curiosity. Now, did you know curiosity was a most powerful agent in human advance? Really all that constitutes our present civilization, all that advances us above the animal, is because some one was curious to know and set about investigating. One of the wisest provisions of nature is that she makes curiosity such a strong feature in the child.

"The ticking clock is one of the very best means of starting the development of curiosity. It is not something to be afraid of, for his mother is singing 'tic-tac-toc.' As he grows older, of course the mystery will dissolve; just at present, while he knows nothing about life and has no words to express himself, the substance of his thought is that the clock is something alive; but what makes it stay still? That is a curious problem for him. Curiosity is at work."

Froebel's Theory

"But, brother," protested Helen, "Froebel gives us a different idea of the value of the game. He thinks that, instinctively, children have an idea of the nature of time, and that the ticking of the clock develops that idea and so from this game we can help the child to understand the value of time, punctuality, and other things he should know about."

The Professor was waving two fingers in the air as he continued. "I said there were one or two important lessons, and undoubtedly he is right. But so am I. You surely begin to see that in all the little games of childhood you can trace the faint, shadowy beginnings of traits of character, mental activities that, developed, make the successful man or woman. When will people waken to the importance of childhood plays and the deep significance of kindergarten methods!"

"I deserve a vote of thanks for starting this good-thing game for my son," said Henry, modestly.

The Hiding Game

Helen was explaining to Henry the little game of hiding baby's face behind a handkerchief or on her breast, then hailing its reappearance with joy. "Of course it is old, as you say. I presume mothers have played it ever since civilization began, but not realizing its importance, they have not played it regularly and have failed to get the value out of it that they should. The momentary separation and then the joyful reunion is helping baby to 'find himself.'"

"Too deep for me," commented Henry.

And so it was that the Professor was called in to enlighten him as to the deeper meaning of that game.

"The idea back of all this," began the Professor, after clearing his throat, "is to develop the idea of separateness. The baby has a confused idea of unity. Now, it is necessary that he come to a realization that he is an individual. Of course, he could not possibly understand the big word in which this is stated, but as a faint beginning, the idea exists in his mind. Now if it be true that play is nature's way of helping the little child to develop, a philosopher could not have invented a better plan.

"And," continued Helen, "the little song I sing, and the delight I manifest when, removing the handkerchief, I see his face again, helps him in other ways."

"It is a continuation of the 'falling game," resumed her brother. "It is helping baby to a consciousness of self, yet with a feeling that he is still surrounded by your love. So it is that nature sets the mother to playing with baby all these handkerchief games, all peek-a-boo games, the 'come from behind the chair' games. Let mothers be told they are not foolish at all. It is an instinctive effort on their part to help their little one to an idea afterwards to be of great importance in life.

Summing Up

At this point, we close the biography of Baby Smith. And now for a brief talk with parents. A little child has come to your home. For a few brief years he is under your sole charge; after that the school will begin to share in the work of education; and then he is dismissed to the great school of life. Of formal education, in the ordinary sense of the word, you apparently are doing very little. But we assure you that nothing can surpass in importance the development you are assisting during the first few years of baby life. It almost startles mothers to think that in the apparently foolish little games they have been playing with their babies, the baby-talk songs, the "knock at the door, peek in, lift up the latch, walk in" object lessons, they are instinctively assisting nature to start the germ of ideas in the little mind destined to shape his entire life. The games we have specifically mentioned are but few. Every mother knows many more. They all belong to kindergarten methods. We urge you to review them, fix them in your mind, dwell on the lessons, then give full rein to your heart's desire and play them with your child. Such is nature's way.

Your little child came into the world not, however, with a stock of ideas suitable to the present age. Nameless instincts, longings, passions, and desires are latent within him. It required thousands of years for the race to cultivate the desirable, repress the undesirable, and so come to our present enlightenment. Under pressure of our present life your child, in a few years, is to traverse that arc of progress. It is yours to help. The very best way to afford this help is to co-operate with nature; to play such simple games as here mentioned, and let mother love ever shed its benign influence.

THE SMITH CHILDREN

We are presented with a different setting when we open this chapter of the Smith family life. The baby of our earlier account is now Master John Smith at that interesting age of "going on five." But a fullness to our story is rendered possible by the presence of a younger sister, Mary, for thus the family circle has enlarged. The parents discovered that the content of kindergarten education showed no evidence of decreasing interest with passing years. Instead, there was a deepening conviction that every year was becoming more and more important. If in the first year of life they had felt it their privilege to assist baby to come to a knowledge of self, to encourage through baby games the faint beginning of unfolding mind, they realized that parental duty in this respect kept pace with child growth. "In fact," as Helen said, "the importance of their work was now at its height. In a few years the state, through its organized machinery of education, will insist on taking charge of our children. But it is our privilege to lay the foundations on which the state is to build. And everyone knows the foundation is the most important part of a building."

"ABSORBED IN BUILDING SOME WONDERFUL STRUCTURE"

The Constructive Faculty

In the Smith family, the children playing with the various Froebel gifts was a common sight. Mary might be seen sitting on the floor, absorbed in building some wonderful structure, jumping up now and then to fetch a doll or some animal to complete the scene. It was a proud moment for the little girl when, her work completed to her satisfaction, she called others to inspect it. She would explain that "this is a house where a little girl lives, this is the father just come home, this is a table laid for dinner," and so on.

"She is striving," explained the Professor, "to interpret the world by creating its images. I do not know as I make myself plain, but in that little child's play you see the beginning of the mental activities that advance life. She produces forms, her imaginative faculty is at work to find a use for these forms. Ideas as to family relation are also struggling for expression. I hope you show an interest in her work."

"Yes, indeed," replied Helen. "I make it a point to lay aside my work; if necessary I ask questions and show that I am interested."

"Why would it not be well to help her make better shaped houses? Build a model and let her imitate it?" questioned Henry.

Do Not Interfere

"Not at all. It is all right for suggestions, but beware of the sugar-plum idea. Let her work out her own ideas. Reflect that in these plays children are trying to out-picture the story as they see it in their own mind. The result may be very crude, but they are experiencing the joys of the inventor. Don't stifle that feeling. Don't do the work for them, let them image as best they can the picture they dimly see. I can hardly find words to express all the elements of value that Froebel finds latent in his plays with his various gifts."

"You know how that is, Henry," interposed Helen. "I have heard you say many times that if you only could clearly express to others, or even to yourself, what you dimly see and feel, you could do far better work than is possible now."

"Indeed I could, but—come now—has that anything to do with playing with Froebel's gifts — his cubes, triangles, longer sticks, cones and so on?"

"In a way, yes," responded the Professor. "To emphasize an idea just expressed, the child is endeavoring to express in outward forms what she dimly sees in her mind. The artist, the architect, the man of business before whose mind float dim ideas of far reaching plans, are making efforts similar in kind, of course much further advanced. This is the baby effort; that, the earnest efforts of a mature man. Don't you see the thing to do is to assist in developing that faculty?"

Overcoming Difficulties

"In that same line," put in Helen, "I will tell you of a victory won by little Mary only the other day. I have always had her do what she could in the way of dressing herself, but some little things I did myself feeling that they were too hard for her. But I was busy and she dressed herself competely. I heard her saying 'I did it all myself, and mother didn't help me at all.' Her face and actions expressed the joy which she felt."

"And her satisfaction was right and natural," concluded the Professor. "It was the joy of discovery of power within herself. Parents should always have children do what they can in the way of self-help. Too many unthinking parents and teachers, in mistaken kindness do for children what children can and should do for themselves. Overcoming such simple difficulties is part of the discipline that produces men and women of power and resource. Individuals that are fearless because they are independent.

A Wrong to the Child

"Parents should beware of stifling this nature-ordained impulse of the young

mind, this dim striving of the soul to express his mental images. The majority of mankind are ever struggling to give form, vitality to their dream or ideals. Failure to do it is the tragedy of life. No, let the children play and work out their ideals. They had far better be doing this even in later years than simply memorizing facts, letting other people's ideas run through their heads with little opportunity of giving experience to the ideals which should be aroused by their study."

At this point Henry looked at his watch and this action broke the flow of earnest counsel, and the Professor brought his remarks to a rather abrupt close.

"But I really am making too much of a lecture out of this. Let me see—oh, yes; by the way, why not make a practical application of these lessons right now? Let Helen make a note of the excellent traits of character which she thinks these plays develop. She will then experience the same problem that little Mary does, trying to express clearly what she sees dimly. Perhaps Henry will note some point, and—"

"As usual you will be umpire, and put in the finishing touches," concluded Henry.

Concentration

"I think I understand better than ever how difficult it is to express oneself," began Helen, the next evening. "I don't know just how to say what I dimly sense as the value of these games. I will mention concentration, and I know you all realize its value in character. Surely that is a trait that our children strengthen in their games. Mary cannot build her houses unless she gives her mind to it."

"Now," put in the professor, "remember, play is the serious business of children. What ought to be your attitudes in regard to interrupting their play, breaking in on their game perhaps with something that you wish them to do?"

"Why I—really I never thought much about it. Of course, I expect them to mind when I speak."

The Professor's Theory of Obedience

"Yes, certainly, but whatever they are playing it is for the time being a serious affair to them. Now, I have a theory that parents ought to be considerate in this matter. An architect drawing a plan, an artist trying to paint a scene that he sees with his mental eye, demand that no one interrupt them. Relatively, the child is engaged in work of greatest value in developing his own powers. Parents ought to have some regard for this. Here is a little fellow building a wonderful castle, let us say. He is called to do something and delays long enough to complete the wall round his castle, so it will be safe to leave it; you know hostile knights are coming through the woods and he must make it safe. He is informed that he is a very disobedient little boy; good boys come at once when they are called. There are ways of impressing the necessity of obedience, without destroying his dream by breaking in on his work too abruptly. Parents do wrong, for there was no disobedience in the heart of the child."

"How different it used to be!" mused Henry. "I know I had to respond as promptly as possible or father gave me a turnover, not near as pleasant as those mother baked for me."

"And only yesterday you were complaining that if you could clearly express your plans you might astonish the world. Now, don't you think it would have been better if your father had done his best to help you to habits of concentration and execution in what some might think were mere trifles, rather than to insist on instant obedience, making that the great virtue? Later, teachers will complain that the children thus brought up lack in concentration and perseverance. How many parents ever reflect that possibly they are some to blame for such a condition. But, what else, Helen?"

Originality

"I was watching Johnnie and Mary at play today; I don't think they knew it, though. I never realized what a splen-

did drill in originality the games must be for the little minds! Johnnie started to build a barn where he was to keep horses and cows, but I noticed he finished it up as a magnificent tree, where he said an old owl had her nest. Now that was invention. He started to build a barn, he suddenly was struck with another idea. He invented a tree. In that act I thought I saw another value in his games."

The Professor was rubbing his hands in warm approval.

"You surely have," said he cordially. "And this inventive sense that he suddenly set to work is going to give him a suggestion of power over things. He feels free to depart from mere imitation and copying. The gifts and suggestions you may have made as to their use are now subordinate to his knowledge that he can invent other forms with all this. It is this idea which helps the faint begining of traits of character on which success depends. But we ought to ask brother what occurred to him in connection with these games?" And he turned to Henry.

What Henry Saw

"I—er—well, I pass. But I did catch myself thinking how different all this was from my early training. I believe I might have been more in many ways than I am if my early training had been along these broad, constructive lines. Of course, it is too late for me. I will just have to plod along as best I can. But say, I want John and Mary to have an all-around development and I suppose I must help in whatever way I can in this work; but just how, 'Aye, there's the rub.'"

Froebel's Great Discovery

"The most of us grown-ups can sympathize with your feelings," remarked the Professor. "We are all sort of back-numbers. We have played our little play. All we can do is to help children. I have been thinking over the children's plays with Froebel's gifts. What I have to say may sound stiff and pedantic, but I am sure you know my heart is all right, so excuse this little lecture."

Henry was somewhat alarmed at this opening, but he kept a discreet silence.

"I want to impress on you a sense of the value of these plays. Froebel was a genius; he dissected the mind and plays of childhood as no other man ever did. His great discovery was that play was nature's method of childish development. Not simply physical development, but development of social, moral, and intellectual faculties; consequently during the first years of life the duty of parents is to guide and control the plays of children. During babyhood nature goes further and sets the baby and mother playing baby games, as we know, of the most trifling description, laying broad and deep the foundation. From the age of say, three to six, when the formal education of the school begins, it is the privilege and duty of parents to guide the play instinct.

What Froebel's Gifts Really Are

"The various kindergarten gifts, as Froebel calls them, are objects which, by a flash of genius, he selected as being simple means by which the child can become acquainted with the world that surrounds him, and which shall serve as symbols and also as means to express the thoughts suggested by works of nature. Don't imagine that anyone thinks the child understands the big words with which I clothe my thoughts, but in a dim, feeble, childish way you help the child to understand the world and his relation to it.

"Helen has seen in the plays of her children the faint beginning of some of the traits of character making for success. There are other traits besides the ones she mentioned; in fact all essential traits are thereby encouraged. The breath of life is breathed into them, and they have commenced to grow. But there is greatly more involved. As we psychologists say, these gifts and play-

ing with them assist the child to come to a knowledge of self.

A New Theory of Education

"Let me explain this dark saying. For many years the theory of education was that the child advanced by gathering and storing in the mind facts, which process gave him knowledge. The real truth is this: Education consists in so training the brain that it can understand and give expression to knowledge already possessed by the mind.

"Let us learn a new lesson from the lily of the field. Hidden deep in the earth is the bulb where life sleeps. Warmed by the sunshine, fed by spring showers, this life stirs, swells, mounts, and blossoms into a beauty greater than that of the king in his glory. Life was in the bulb. What it needed was heat, moisture, and light. When the inner impulse to grow was awakened this life reached out eagerly for all the food it could appropriate from earth and air, to build into the body the force stirring within it. So it is with the mind. Latent in it are creative energies. Quicken these energies, and the mind itself will reach out for knowledge as the only material through which it can realize its own deepest impulses.

Nature's Education Agencies

"Nature makes play, curiosity, and imagination the three great factors conducing to this result during the first few years of life. What we should do is to sense the importance of these factors and be co-workers with nature in guiding the instinct of play. It required a genius like Froebel to gather these necessary gifts that assist in this work. I need only say that the pendulum of educational theory is rapidly swinging in the direction indicated in these remarks. Kindergarten exercises, vocational training, manual training, are each and all recognitions of the great truth that a mental collection of facts, however well arranged, is not education, which consists in the possession of faculties so trained that powers inherent in the mind can come to an expression. Kindergarten training is the first step in this grand, new theory of education.

Let the Children Play

"And so, sister, let your children play the kindergarten games with these gifts. It is yours simply to direct this playing. Do not attempt to instruct them as to the properties of cubes, spheres, squares, triangles, etc., not at all; spheres are balls which Johnnie and Mary are to roll, bounce, toss, catch, whirl, and spin; the cubes are blocks wherewith to build; the squares, triangles, sticks and rings are not geometric polygons and lines, but material for expressing mental pictures. The great new fact is that playing with them concentrates attention on them, and thus makes them helps to understand the sense of what is written in the book of nature.

"But I must confess," he added after a hurried examination of his watch, "the evening has passed and I am afraid you have been given a rather indigestible mass of information. I think we can find still other lessons to be drawn from these games for some other evening's talk, and besides there are the simple games of childhood which you are to consider, for the kindergarten games are only one division of the games of childhood, in one sense of the word, they are rather artificial and teach no more important lesson than the plays children have been playing for years."

Carefulness and Exactness

"I have been studying how best to develop habits of neatness and exactness in children," said Helen, some evenings later. "I want them to appreciate that such habits assist them to produce satisfactory results in their play, but I want them to discover that fact for themselves. So I have furnished them a yard or so of oilcloth marked in one-inch squares. Now I can praise the struc-

tures that are built straight on the line of the squares, and I have started them in the use of comparison by means of numbers. I ask them where the tower is the highest, or where the train is the longest, and inquire how thick is the wall they have built. In many ways I can help them."

"That sounds good to me," was Henry's brief comment.

"It is in accord with the most advanced ideals of new education," put in the Professor. "Just how ideas of space relations originate is a point that we may not be able to settle. But we can see how Helen's question with the objects built on the ruled oilcloth is going to stimulate conceptions of form, design, and number relations that are so essential in life.

Stringing the Beads

"It takes so little to make children happy!" observed Henry.

"Yes, what made you think of that?" queried Helen.

"I was watching the youngsters playing with the kindergarten beads, stringing them on a shoestring, you know."

"And then, besides the amusement, there is training in other directions," continued Helen. "The beads, you know, are of different colors; in fact, there are some of all the seven colors. It is not simply stringing the beads, but they are learning about colors, and then just a hint as to arranging the beads, so many of one color, followed by so many of another, why Johnnie will spend hours at a time in that exercise, trying to make a neat and artistic looking string."

"Observe, Henry," said the Professor, "the little boy is becoming familiar with colors, he is advancing in knowledge as to the artistic effect they produce, and finally he is learning about numbers. Help him to develop through play all these mental traits and then when he goes to school the foundation is laid on which to build."

Straws and Colored Paper

"I have acted on a suggestion I found in one of my books that I think is a good one," was the way Helen began the following evening. "I have taken straws and differently colored papers — red, blue, yellow — and set the children to stringing the straws with colored paper, making chains, you know, and I have promised to let them decorate the room by making long chains, to connect them in various ways, and hanging them on the wall. I believe Johnnie is a natural born decorator. Of course, I know it is not exactly high art, but it is a beginning just the same, and he does study!"

"Be sure and sympathize with his efforts, praise his work, and give suggestions for improving the same," said the Professor, earnestly; "everything he is doing is self-developing work. It all counts. There is one point you perhaps have not thought of. The idea of letting him decorate his room is fine. Suppose his results are childish, what of it? He thinks he is doing something to help make the home enjoyable. Nourish this feeling all you can. Just such little points as this, overlooked by many parents, are the starting point of a development that will help in life."

The Box of Paints

"One good turn deserves another," remarked Henry, "seeing what good use Helen made of straws and colored paper, I have concluded to help our boy start on his Michelangelo career by presenting him with a box of paints. Maybe he will start by painting some scene on the wall—how about that, Helen?"

"Don't give any such suggestions to start with. Better still, give another direction to his efforts. Set him to coloring up pictures in old magazines and old picture books. There may be a picture of a house. Tell him to put on the colors. You have no idea how valuable such exercise becomes. He can't understand anything about perspective, but he will soon learn to use a different stroke

for the end of the house than what he uses for the side. See?"

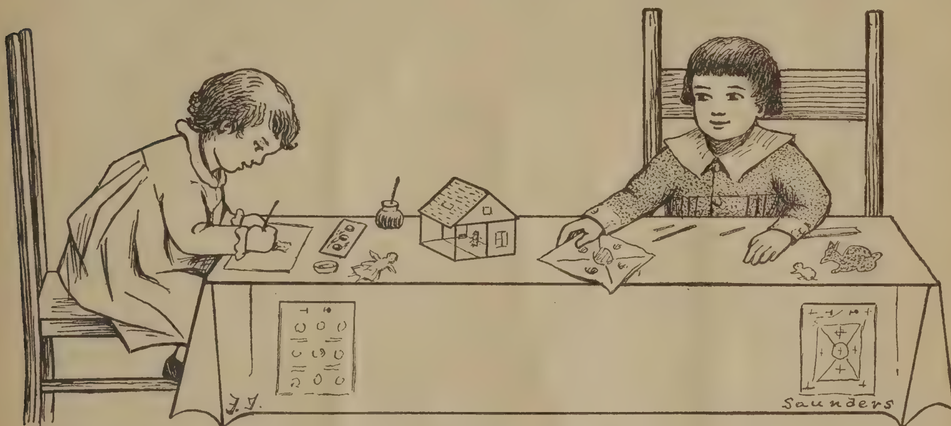
"Let me add to that this thought," put in the Professor. "The idea of perspective—in fact, artistic qualities generally—exist in a dim way in his mind; all these exercises are helping him to express the ideas. They are bringing him to a knowledge of self, and that is—or should be—the aim of all education."

"Henry has contributed the paints. It is my turn next. I am going to get him a black-board, and colored crayons," said Helen decisively.

express in outward form his dim sense of proportion and so on. What are you doing, Helen?"

"Nothing very deep, I assure you. He has been cutting out squares, circles and triangles of colored paper. I have suggested that he might paste them onto a strip of paper so as to form an ornamental border. The idea is taking just fine," she concluded, with a laugh.

"All of which not only amuses him, but is most helpful. Now without using any big words about it, help him to an idea of the law of design. That is, you



"SET HIM TO COLORING UP PICTURES"

"And ever remember," concluded the Professor, "that while the results of his efforts will be crude, nothing but daubs, you might say, treat them with respect. The real results of all this work will not be visible, but will be wrought into the fibre of his life and character."

The Young Designer

"I have found a new angle for Johnnie to develop artistic impulses," remarked Helen. "I have started him on design work. What do you think of that?"

"And now a designer," commented Henry. "Are you not afraid of mixing him all up?"

"It might in serious life," said the Professor, "but we are not after finished products. What we want is to help him

know, that opposites must be alike. Let him begin with some central figure, say a circle, then if he adds to the top, make a similar addition to the bottom, and then the sides, but don't help too much. Let him get the germ of the idea in his mind. Encourage him with the idea that when he makes a real pretty design it can be used as a border along one side of his room. Remember about the chain of straws and colored paper?"

With Scissors and Paste Pot

"What new?" This was Henry's greeting. He could tell from the look of triumph on Helen's face that she had a new field of amusement for Johnnie.

"I have gone into the scissors and paste work. I have a pair of blunt scis-

sors, some old magazines, and I am going to let Johnnie cut out the pictures and paste them into this blank book. What do you think of it?"

"Great! I say, why not get him a scrap book in which he can paste the pictures he cuts out?"

"And let me add another practical suggestion," interrupted the Professor. "Let him have some end to be attained by his cutting and pasting. For instance, let him start with a picture of a barn. Put that on the first page. Now he will cut out pictures of everything that naturally goes with a barn. Horses, cows, chickens, and so on, also a hay stack, wheat field, machinery such as wagons, plows and so on. This will all be a splendid drill for him."

The Doll's House

"And Mary can have a Dolls' Book," said Helen, animatedly. "She can put in a real house. On the following pages the dolls that live there, and then all that goes to make up their home. Tables, chairs, sewing machine, piano, stores; I think these are all splendid ideas. It is your turn, Henry."

"I was thinking—don't know how it will strike Helen—that most boys—I guess girls, too—like to play in dirt. I know I did. Well, why not a sand pile in the back yard for them to play in when weather is suitable? And then, down at the kindergarten store, I noticed some specially prepared clay, which I believe would give them a great deal of pleasure in making models. They can make models of birds' nests and eggs, you know, and some other objects. If my learned brother will permit me to use big words also, why will not all this—er—help him to picture out his inner visions? Ain't that the idea, Professor?"

"You have done very well," smiled the Professor. "All joking aside, your ideas are excellent. All these childish activities are of the greatest use. Now, don't understand that they are for the purpose of making artists or designers or sculptors of children; they are simply for the purpose of developing ability on the part of children to clearly express mental conceptions. The majority of men and women go through life conscious that they cannot express in words, or put down in writing, or carry into practical execution plans that are dimly present to their understanding. You can now see why nature has made this feature of child play of such great interest to children. Let us help this development."

Freehand Cutting and Tearing

Helen had been silent, evidently thinking, and so Henry reminded her that it was her turn to make a suggestion.

"I was thinking that we have really only made a beginning in paper and scissors work. Why not initiate the children in cutting out scrolls and other designs? You know we can fold paper and then a slight cut here and there will result in all sorts of borders, perhaps with waving lines along the sides. I am sure I can find books that will give hints along these lines."

"That is really the next step in paper cutting," continued the Professor. "It may be a trifle advanced, but let them study it out. Take a simple sheet of soft paper, large size letter sheet; fold it in various sizes, cut off the peaks of the corners, now with circles, then other shaped cuts and note the resulting effects. It will prove an excellent drill. But do not neglect free hand cutting of animal figures and other simple outlines. Let them begin with simple figures, such as circles, triangles, then advance to animals and fruits. The books that Helen speaks of will give you an abundance of designs. Tearing paper—distinct from cutting—is another useful game. And all these games help in many ways that you do not realize until you make a study of them."

A Means of Studying Children

"I have found that I can study the children's peculiarities by observing them at play," observed Helen. "There is a

difference observable in the way Johnnie builds his houses, and Mary's way. Mary seems inclined to go ahead without thought of results and her buildings are apt to fall down; Johnnie, on the contrary, is, if anything, too careful, too precise. He is more inclined to follow some plan he has developed; Mary is quick to change. I notice, also, in general, Mary is quick to notice new things, Johnnie develops old ideas."

"That observation is no doubt just," said the Professor. "Now turn it to some practical end. Strive to develop the boy's quickness of perception, his curiosity; tell him you want something new in the way of design. Mary needs to learn the lesson of thoroughness. It is not something new you wish from her, but how good a house can she make."

Quickness of Perception

"I ran across an idea the other day," began Henry, "that I believe can be used to help Johnnie to quickness of perception, and since you think he wants that, why not give it a try? It is this: Helen and Johnnie walk through the garden. Afterwards, sitting in the living room, Helen says, 'Let us walk in the garden, what do you see?' 'I see a currant bush,' says Johnnie. 'Yes, and I see a bed of lettuce,' replies Helen. 'And I see some potatoes,' puts in Johnnie. And so they go on telling everything in the garden. Now, a few plays like that, and Johnnie will see just about all there is to be seen. He may even notice the toad under the cabbage leaf."

"That illustrates the case exactly," continued the Professor. "By observing your children at play, you note traits of character that need to be strengthened. Set your ingenuity at work to invent some game that will help effect such a result. Ever remember the great law of childhood: Play is nature's way of instruction and development. It does very little good to give such monitions as 'Don't do that' or 'Do this.' Nature's way is to set them playing. It is yours to help in this work."

Higher Ideals

"Talking about this game," continued the Professor, "has reminded me of the wonderful influence that parents can exert to help the little child in his thoughts of what we vaguely call 'higher things.' The plays of childhood become the realities of later life. Parents that treat the first mental and spiritual outgoings as of little or no account will look in vain for the ripe fruit in maturity. The seeds of all good and evil impulses are springing into life. Like the tares and wheat in the parable, desirable and undesirable traits come early into action. By studying the child at play, you can see much more than what Helen saw to develop."

"Oh, well, there is the Sunday school," put in Henry.

"I was not considering that at all," said the Professor. "Children do not need catechisms but thoughts directed into such channels that the really essential higher ideals will be formed. For instance, a load of coal arrives at your home. Why should not the children see in the grimy driver one who is kindly helping them keep warm, by no means one to be looked down on because he is dirty. The poorly dressed little fellow that brings in the groceries is a worthy friend who helps him to a good dinner. Even animals are all helping. You certainly are assisting the child to a dim idea of unity of brotherhood—and other noble traits by instilling such thoughts. Parents should consider every means possible to encourage higher thoughts—not by way of formal monitions and words of advice, but in the way here suggested and by watching their plays.

What Play Shows

"In their plays, the ideas in their mind will come to the front. During our civil war, so I read, the boys promptly invented war games. They were never tired of building forts, fighting battles, capturing prisoners, and so on. And in turn the plays are forming character. 'I

spy,' 'tag,' 'Puss in the corner' are doing much more than to develop muscles. Let parents be quick to impress the child with the thought that all such games must be played fairly, play the games in a manly fashion, play it out no matter if he must be 'it' most of the time. Play it whether he stubs his toes, bruises his shins or tears his clothes. The boy trained to take his part in boyish games, manly and with courage, is going to play more successfully the game of life."

"I wish," said Helen, "that all mothers realized how much was involved in the plays of childhood. There is so much for us to learn. I was just thinking, teachers are expected to prepare for their work by years of careful training, yet we, their co-workers in the education of children, who really have the more important part, since it is our privilege to shape the mold to which his character sets, go at our work utterly unprepared, save for instinctive impulses and mother love implanted by nature."

An Appeal to Parents

Taking our leave of the Smith children, let us gather the points to be emphasized, the lesson that we wish to impress. The old order is changing in every department of life. The home training of children is no exception. The old view was that children must be taught to reverence authority, unquestioning obedience was insisted on, they must be well behaved and decorous, well trained little men and women. The newer view does not deny the value of this training, but it lifts attention to a conception of childhood far above such narrow views. The older view is the pent-up one from the valley; the newer view is from the heights, where we sense somewhat the priceless importance of childhood. We realize that children, even little babies, are persons; that it is a parent's duty, as it should be a pleasure, to help their children develop all those innate powers of the mind which conduce to a life of efficiency.

The Kindergarten and Montessori Methods

The more formal discussion of Kindergarten and Montessori methods for teachers now follows. Let us understand at the start that the aims of these methods are the same. Froebel's kindergarten discussion made a new tendency in education and marks the beginning of a new era in its history. Since then, interest in child study has constantly increased, and the care and education of little children in both home and school have become more intelligent. The different methods of approach in these two systems have, however, resulted in a difference in methods, programs and devices. But for those who catch the wider vision, all such mere difference in detail, not only in the methods under discussion but in others that the future will surely originate, will disappear in the larger whole of a more perfect knowledge of the nature of infancy and the means of educating young children.

THE KINDERGARTEN

Introduction. For the busy mother it is often difficult to find means to keep the young child interested and happy, and at the same time so occupied that he will be gaining knowledge and forming habits which will prepare him to enter school when he reaches the school age.

By means of the kindergarten, the mother can do much to lessen the strain which entering school brings upon every child. By use of kindergarten exercises in the home, the child can have his activities directed to a definite end. He can be taught obedience to law, regard for the rights of others, cleanliness, promptness and order. All of these requirements follow each other so rapidly when he enters school that unless he has been in a measure prepared for them, he becomes bewildered and soon acquires a dislike for the new life upon which he has entered. In the following pages the underlying principles of the kindergarten are set forth, and exercises suitable for the home are described. The reader is also recommended to consult the articles *Froebel* and *Kindergarten* in The Home and School Reference Work.

PRINCIPLES

The kindergarten was founded by Froebel for the purpose of leading the child by natural steps in the development of all his powers. It is founded upon the spontaneous activities or play of children. Froebel stated the foundation of his system as follows:

"The plays of the child are, as it were, the germ of the whole life which is to follow, for the whole man develops and manifests itself in it; in it he reveals his noblest aptitudes and the deepest elements of his being. The whole life of man has its source in that epoch of existence, and whether that life is serene or sad, tranquil or agitated, fruitful or sterile, whether it brings peace or war, that depends on the care, more or less judicious, given to the beginnings of existence."

Painter, in his *History of Education,* gives the following summary of the principles underlying Froebel's system.

1. The task of education is to assist natural development toward its destined end. As the child's development begins with its first breath, so must its education also.

2. As the beginning gives a bias to the whole after-development, so the early beginnings of education are of most importance.

3. The spiritual and physical development do not go on separately in childhood, but the two are closely bound up with each other.

4. Early education must deal directly with the physical development, and influence the spiritual development through the exercise of the senses.

5. The right mode of procedure in the exercise of these organs is indicated by nature in the utterances of the child's instincts, and through these alone can a natural basis of education be found.

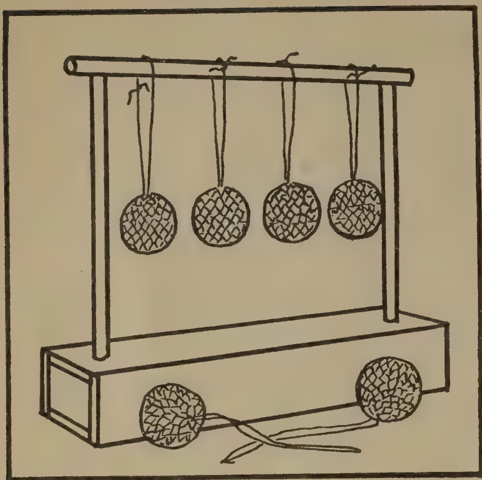
6. The instincts of the child, as a being destined to become reasonable, express not only physical but also spiritual wants. Education has to satisfy both.

7. The development of the limbs by means of movement is the first that takes place, and therefore claims our first attention.

8. Physical impressions are at the beginning of life the only possible medium for awakening the child's soul. These impressions should, therefore, be regulated as systematically as is the care of the body, and not be left to chance.

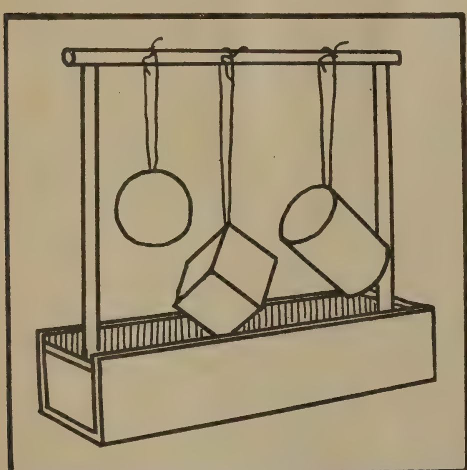
GIFTS

Froebel developed his system by the use of carefully selected objects which he termed gifts. The most important of these are the following:



THE FIRST GIFT

1. The sphere. In its present form this gift consists of six worsted balls, each with a string attached, by which the child can hang the ball upon the frame accompanying them. The balls are of different colors, and, with the pins for the frame, are enclosed in a neat box.



THE SECOND GIFT

2. The sphere, cube and cylinder. These objects are each two inches in diameter and made of wood.

3. A two-inch cube divided into eight inch cubes.

4. A two-inch cube divided into eight brick-shaped blocks, each two inches long, one inch wide and one-half inch thick.

5. A three-inch cube, divided into 27 inch cubes, three of which are divided in halves diagonally, and three others into fourths by two diagonal cuts which cross each other.

6. A three-inch cube divided regularly into 36 pieces, 18 of which are blocks of the same size and shape as those in the fourth gift. Of the remaining pieces six are cut into halves across their breadth. Three others are cut into halves lengthwise, making six square prisms.

7. A box of thin, square and circular tablets one inch in diameter, with colored squares and circles of cardboard of the same diameter.

8. A box of square colored sticks.

9. A box of rings made of silvered wire. Some are divided into halves and some into quarters.

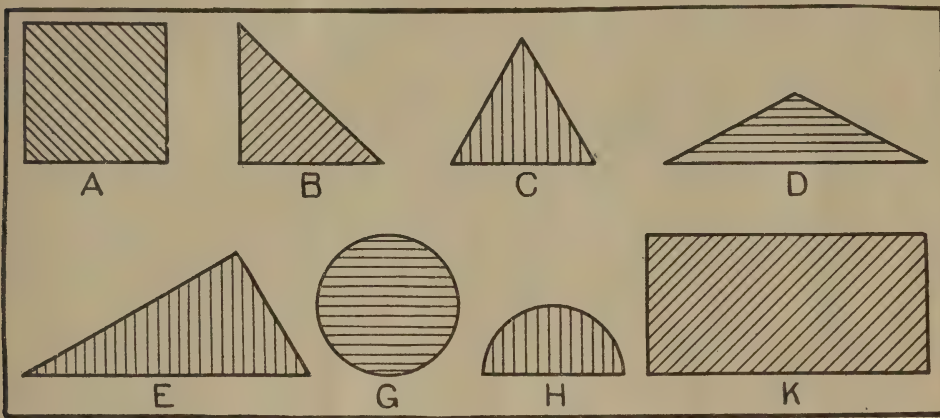
10. Other material. This consists of oblongs and triangles made of wood or cardboard, gummed circles and squares cut from colored paper, and colored paper cut into squares suitable for folding.

MATERIAL

Kindergarten material can be obtained of any school supply house, and that of most use in the home is inexpensive. To illustrate: the sphere, cube and cylinder of the second gift are made in half-inch sizes, perforated for stringing, colored and put up in boxes containing 12 of each form. In this form they are known as beads.

By purchasing a few of the wooden tablets of each form to use as patterns, any number can be cut with scissors from inexpensive cardboard. Toothpicks can be used in place of the wooden sticks which constitute the eighth gift. The colored paper and gummed squares and circles are made from expensive stock,

but such small quantities are needed that the expense of procuring them is slight. Cheaper grades of colored paper can be procured in almost any local printing office. These are suitable for chain making and other exercises, but the colors are not so good as those of the more expensive grades.



KINDERGARTEN TABLETS

In case a kindergarten outfit is purchased at once, only *one gift* should be given the child at a time.

In addition to the kindergarten material the child should have a low table and a low chair. The table can be made, if necessary, by sawing off the legs of a common table or, what is better, of a folding table, but the chair should be purchased. With the outfit here described, a large number of interesting and profitable exercises are possible.

EXERCISES FOR THE HOME

Bead Stringing. One of the first playthings that a baby has is a rattle. This usually consists of a hollow rubber ball attached to a cylindrical handle. Later he is given a ball without the handle, so he is already familiar with two of the three forms found in the beads.

Give the child the beads and the cord that comes with them. Ask him to string all the red ones, then all the yellow ones. In the first exercises, let him place all the cubes together and all the cylinders together. When he becomes thoroughly familiar with the forms from handling them, vary the exercises by asking him to string a cylinder, a cube, then a ball, following this order until all beads of the same color are used.

In the next exercise, let the colors as well as the forms change, as a yellow cylinder, a red cube and a blue ball.

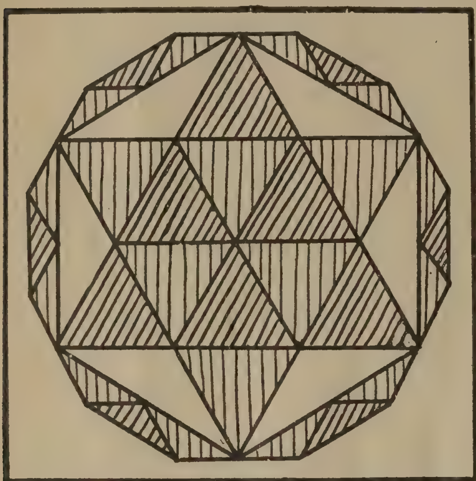
Cautions. 1. In speaking of the beads, always refer to them by their correct names, as cube, cylinder, sphere or ball.

2. Do not continue these exercises until the child tires of them. Intersperse them with other exercises.

Paper Chains. Cut paper into strips one inch wide and six inches long. Provide the child with paste or mucilage and teach him to make paper chains. Children enjoy this work and will return to it again and again if the chains are preserved and used to decorate the room, Christmas tree or some other suitable object. By using different colors that are harmonious, very pretty chains can be made.

Building with Blocks. The blocks constituting the gifts in which they occur are far more useful than ordinary sets of building blocks, and with them

the child of his own accord can make a great variety of objects. In the use of these blocks he is learning form, number and design. With a hint now and then from the mother he easily learns to make more complicated structures.

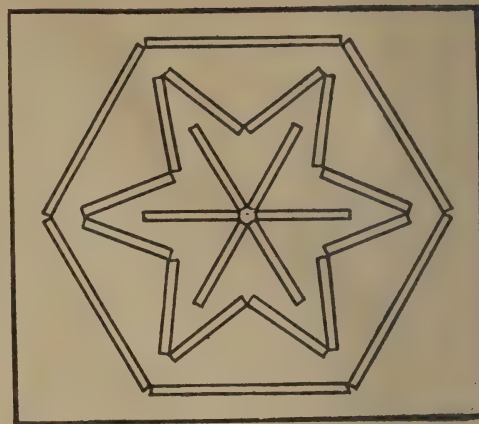


TABLET DESIGN

Making Designs. With the tablets many interesting and beautiful designs can be made. If cardboard tablets are used, lead the child to select harmonious colors. The exercises should consist in copying designs from others and constructing original designs.

Stick Laying. Sticks cut one, two and three inches long can be used to form designs equally as interesting as those made from the tablets.

Work with Sand. Fortunate is the child who has a sand pile to play in. Wherever there is a yard this can easily be provided. A single load of sand will answer the purpose, but two or three loads are better. If the base of the pile is enclosed with boards, it will remain intact for several seasons. The



STICK-LAYING DESIGN

sand furnishes a never-tiring source of amusement and exercise, and several children can play in it as well as one. The child builds mountains, valleys, castles and many other objects as his fancy dictates. In doing this he is gaining control of his muscles and indirectly gaining some conception of the meaning of geographical terms.

Clay Modeling. If clean potter's clay can be procured (a quantity the size of a brick is ample), let the child occasionally model the forms he is handling. The modeling should be in this order: sphere, cube, cylinder. All other solids are modifications of these three forms.

Objection to clay modeling is often raised because it is "mussy." All this can be avoided by using clay of good quality, having it worked into a thoroughly plastic state and of just the right degree of moisture before using it.

Other Exercises. The foregoing exercises will suggest many others in accordance with the time and inclination of the children and the mother. In all exercises, system, order and neatness should be insisted upon.

Montessori Method

That the mothers and teachers of America are keenly alert for ideas which may prove helpful in the great problem of child training was demonstrated on the occasion of Madame Montessori's lecture tour in the United States in the winter of 1913-14. This remarkable Italian woman was greeted by large audiences wherever she spoke, and the most eager interest was manifested in what she had to say.

Madame Montessori's message to this country is epitomized by a sentence she used in discussing her plans: "I must have the aid of the mothers."

The old-fashioned idea that a child's education begins when he starts to school has given way to the truth that education really begins at birth, and that it is in the first six or seven years of life that the habits and tendencies are taking shape, which is equivalent to saying that character formation begins before the child goes to school.

With this tremendous truth facing her, the mother must realize that she has a serious obligation to the being for whom she is responsible. It is, of course, the desire of every mother to see her children grow up to be honored and useful members of the social organization, and fortunately the mothers of the present age are not content to permit their wishes to end in desire. They have come to realize that it is not prudent in dealing with important affairs of life to leave them to chance.

In 1914 there were approximately 100 Montessori schools in the United States. Rhode Island in 1913 adopted the Montessori method officially for its public school system.

Madame Montessori's methods are such as can be applied in a practical way at home by the average mother. We believe all mothers should acquaint themselves with the Montessori work, and for the benefit of those who are not prepared to digest a pedagogical discussion such as the Montessori textbooks give, we have prepared a simple statement of the principles as worked out by the Italian scientist, together with a description of the mechanical devices she uses in her training. A comprehensive sketch of Madame Montessori's work is given on page 1905 in THE HOME AND SCHOOL REFERENCE WORK.

But we believe that the greatest usefulness of the Montessori method in America lies in its introduction into the home, and that its greatest results will be through its influence on the home life of the children.

This wonderful work for little children is easily adapted to any home, and any intelligent mother can readily master its underlying principles and become imbued with the spirit needed for making use of them in the early training of her children.

A knowledge of psychology and pedagogy is not necessary to the use of the Montessori method, but it is very essential that the mother who is to use them should thoroughly understand the underlying principles that follow, and that she should be fully in sympathy with the method. The great danger is that the overanxious mother will do the thing that it is intended the child shall do, and in this way prevent the child's securing the end for which the exercise is given. Therefore, dear Mother, before beginning the work, study carefully the exercises here described.

PRINCIPLES

1. The keynote of the system is found in the statement by the German psychologist Wundt: "All methods of experimental psychology may be reduced to one; namely, carefully recorded observation of the subject."
2. "The liberty of the pupils in their spontaneous manifestations" contains the fundamental basis on which this observation is founded.
3. The method of observation has for its base the liberty of the child; and liberty is activity.
4. Every exercise and each piece of apparatus is designed for the child's instruction and not for his amusement.

One who has made a careful study of the Montessori schools says: "There is no smallest item in the Montessori training which is intended merely to amuse the child."

5. The exercise and apparatus are such as to give each sense the training necessary to bring the power of observation to the highest degree of perfection.
6. The underlying purpose of all the training is the self-dependence and self-education of the child.
7. Discipline consists in activity, work along right lines, not in immobility. The foundation of active discipline is a knowledge between good and evil. "The child should not confound good with immobility; and evil with activity, as often happens in the case of the old-time discipline."
8. This discipline can be acquired only by giving the child liberty.

THE HOUSES OF CHILDHOOD

While the successful application of these principles to the development of the child requires careful study on part of both the mother and the teacher, they are practical and can be carried out in both the home and the school, if those having the care of the children are willing to do two things:

First, to make such a study of Dr. Montessori's system as will place them in sympathy with it.

Second, to exercise the patience and take the time necessary to allow the child to do for himself many things that are too often done for him to his injury.

It is so much easier for the mother to button the dress than to wait for the little fingers to learn the necessary movements, that the child's liberty and also his training in self-help are sacrificed that a few minutes' time may be saved.

Are any duties more important to the mother than those directly connected with the proper development of her child? "He who is served is limited in his independence."

Neither the mother nor the teacher can fully comprehend the far-reaching influence of this idea until she is in sympathy with Dr. Montessori's method and understands something of her plans for carrying it into effect. To this end a description of the Montessori schools, technically known as the Houses of Childhood, for which the Italian name is Casa dei Bambini, is necessary.

The Room. Each House of Childhood is designed to accommodate the children of a small number of families, so that there will not be over 25 children in a schoolroom, if we may apply the

name to one of these so-called houses. A large airy room, well lighted, is most desirable. This should be located on the ground floor, and the walls and ceiling should be decorated in such colors as will make the room bright and cheerful, and at the same time pleasing to the children.

The Furnishings. The furnishings differ from those of any ordinary schoolroom, and even from those of the kindergarten. They are especially designed to meet the needs of the school. Each child is provided with a small table and chair. These are so light that he can easily move them to any part of the room.

Next in importance are the tiny washstands with bowls and pitchers to match, all of such size that the children can use them without difficulty.

Rugs covering portions of the floor, and cases or cupboards in which to store the material, complete the essential furnishings.

The Apparatus. The apparatus has been especially designed to accomplish the purposes of the school. It does not consist of a set of toys, neither does it duplicate the kindergarten gifts. It is designed to keep the children busy because they are interested in what they are doing, and at the same time to teach them through this interest many useful acts. Professor Holmes of Harvard says of it:

"It is quite possible that the real pedagogical value of the Montessori apparatus is due to the fact that it keeps children happily engaged in the exercise of their senses and their fingers when they crave such exercise most, and to the further fact that it teaches them without the least strain a good deal about forms and materials. These values are not likely to be much affected by differing school conditions."

The different pieces of apparatus are best described in connection with the exercises for which they are respectively intended.

The Children. The children range in ages from three to six, though sometimes they are admitted as young as two and a half years. When admitted they are allowed to follow their own inclinations, so long as they do no harm. They are soon led to understand that they must not interfere with each other.

The Directress. The directress is the person in charge. She occupies a more difficult position than that of the kindergarten or primary teacher. She must possess to a marked degree the power of at once effacing herself and directing the children. She directs, not by interfering with the child's activity, unless he is interfering with others, but by watching the children to see that all are happy and busy, and at intervals by calling the attention of the children from what they are doing to those general exercises that seem desirable during the day. In the Houses of Childhood in Rome the children spend the entire day with the directress. Of course, under these conditions much more can be accomplished than is possible in the short day of the American kindergarten.

PLANS FOR USING THE METHOD

Character of Lessons. Montessori lessons given to all the children or to any number of them as a class are of rare occurrence. The development of the individual is the end sought. The lessons are characterized by

brevity
simplicity
objectivity.

Preparation. Such lessons require unusual preparation on part of those who give them. First of all, the words to be used must be carefully weighed and all useless words eliminated.

Secondly, the words used must convey nothing but the absolute truth and they must be as simple as possible.

Third, the lesson must be so presented that the child's attention is fixed upon the object and not on the teacher.

The teacher or mother in giving the lesson must be guided by careful observation of the child. If the desired results are to be reached, his attention must not be forced, and the teacher should be able to tell by the expression of the child's face when his interest begins to lessen. Any attempt to force his interest violates the principle of liberty. "Do not lead the child to feel that he has made a mistake or that he has not understood," says Madame Montessori, "because in so doing you will cause him to make an effort to understand."

TRAINING THE SENSES

Touch. In the provision for training the senses all the senses are given attention. Special emphasis is laid upon training the sense of touch, since by that sense the child gains his most accurate knowledge during the first few years of his life, a fact often overlooked by many parents and teachers.

Moreover, at this age the sense of touch is capable of being brought to a high degree of perfection. This is the golden opportunity for the mother as well as the teacher. If the sense of touch is properly trained during the first seven years of the child's life, it attains a degree of acuteness and a power of discrimination which it will never otherwise acquire.

Ordinarily the sense of touch is not more acute in the blind than in normal people, but necessity has caused them to give it a more thorough training. Normal children whose sense of touch has been properly trained can distinguish objects by touch as well as the blind.

This only goes to show that more than half of us go through life partially blind because we cannot "see with our fingers," as the children say.

Again the sense of touch is fundamental. More than any other sense, it aids sight and taste in interpreting the impressions which they receive. Anyone whose sense of touch does not receive proper training in childhood goes through life with his powers of observation sadly crippled.

The craving for activity in the sensory nerves of the finger tips is the fundamental cause for the child's wishing to put his hands on everything he sees. Instead of giving the child safe opportunities to satisfy this craving, it is too often repressed by the command, "Don't touch," or by the more reprehensible practice of slapping the baby fingers when they reach for the highly coveted object.

The first requirement and the one that precedes any exercise for training the sense of touch is that the hands shall be scrupulously clean, because the children can touch better with clean finger tips. With the washstands, bowls and pitchers provided in the Houses of Childhood, it is an easy matter to train the children to keep their hands clean.

Exercises. The first exercises are those which teach the child the difference between rough and smooth. Provide the children with a tablet, one-half of which has a surface of polished wood or enameled paper, and the other half a surface of sandpaper. Take the child's hand and move it over the surfaces from right to left, holding it so that the tips of the fingers will glide very lightly over the surface, accompanying the action with the words *smooth, rough, smooth, rough.* Then leave the child to his own pleasure with the tablet.

By this method the child learns from the beginning to connect the name with the surface. He becomes fascinated with the idea, and will soon be touching everything in the house, saying *rough, smooth,* as the case may be.

The surfaces presented in the first exercise have a decided contrast, but soon those whose contrast is less marked can be substituted, and in an incredibly short time the child will be able to distinguish such fabrics as velvet, satin, silk, cotton and woolen by touch alone.

Occasionally blindfold the child and see how many objects he can recognize. If this exercise is played as a game, the little one will be eager for it. Occasionally isolating the sense is of great value,

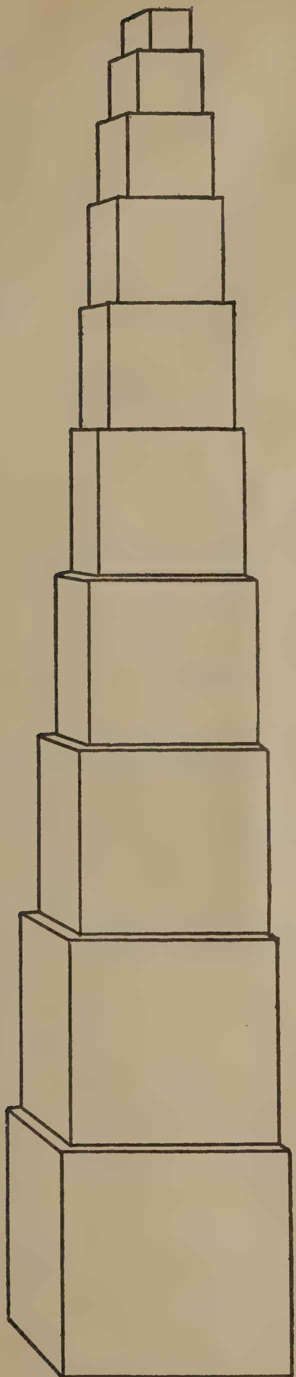


FIGURE 1

but the exercise should not be continued so long as to cause fatigue. Every living room, kitchen and rag bag furnishes material for these exercises.

The second exercise has for its purpose the teaching of form. The child should be provided with a set of rectangular blocks, some of which are cubes and the others prisms. (Figure 1 and Figure 2.) The lesson consists in showing the child how to run the tips of his fingers lightly along the edges of the block. Let him practice for some time with the cube, naming it when you show him how to touch it; then he can pass to the prism and learn to distinguish that in the same way.

It is obvious that this exercise is much more difficult than the first, and it will require a proportionately longer time for the child to master it. He will, however, be interested in playing with the blocks every day and will of his own choice practice the lesson until he is able to distinguish the forms.

When this stage is reached, play the game blindfolded, to make sure that he recognizes the forms by touch alone.

From this stage the child soon passes to the next, that in which he recognizes the objects as soon as he takes them in his hand. When he can recognize the objects this way blindfolded, others can be introduced.

The habit of recognizing objects by touch has been fixed, and the expertness soon acquired by children surprises those who have never tried these exercises. Again, material is abundant. Cubes, prisms, spheres and cylinders are found among household utensils and articles of furniture.

Mix peas, beans and corn in a box and let the child sort them by touch. When two or more children are together, blindfold them, give each the same number of seeds and see who can sort them first. Accuracy is the test in this game; the child who makes a mistake loses. If you join the game you will probably be the loser, unless you had this sort of training in childhood.

FIGURE 2

Cautions. Those giving exercises for training the sense of touch should bear in mind the following cautions:

1. Touching for the purpose of sense training means something entirely different from the indiscriminate handling of objects to which children are accustomed.

2. Remember that these exercises are exercises in muscular control as well as in training the sense of touch, and give them sufficient attention to be certain that the child has acquired the ability to move his finger tips very lightly over the objects.

The Muscular Sense. The exercises for muscular development and control are of two classes: those which have for their purpose the proper development of such physiological movements as breathing, walking and speech; and those which train the child to perform useful acts. The latter are considered as educational exercises. Exercises of the first class consist largely of marching, games and songs. The schoolroom has a part of the floor covered with rugs, upon which the children can throw themselves and lie and kick at will. The child's desire to assume this position arises from the fact that the legs are weak, and this is one of the most natural means of strengthening them.

In connection with this statement, a word of caution to young mothers seems not out of place. The little child should not be urged to walk. For the first four years the legs are the weakest part of the body. At birth the trunk is much more fully developed than the legs, and this condition continues for a number of years. If the child is urged to walk too early, he bears his weight on the feet before the bones of the legs are firm enough to withstand the pressure, and they are bent, thus causing the child to become bow-legged.

If given freedom of exercise, the child will, of his own accord, attempt to walk as soon as his system is prepared for it.

Exercises. The first of these exercises have for their purpose training the children in those movements connected with dressing and undressing themselves. The apparatus consists of a series of frames shown in the following illustrations. The frames are easily made by nailing pieces of lath together and tacking the fabric to the sides. The first frame (Figure 3) is covered with some ordinary cotton fabric, which should be of such color as to make it attractive to the children. Large buttons are more readily manipulated than small ones. A second frame with smaller buttons can be introduced later if desired.

The second frame (Figure 4) shows the fabric arranged for lacing.

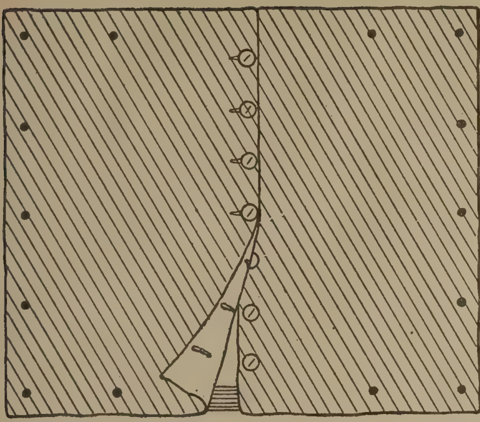


FIGURE 3

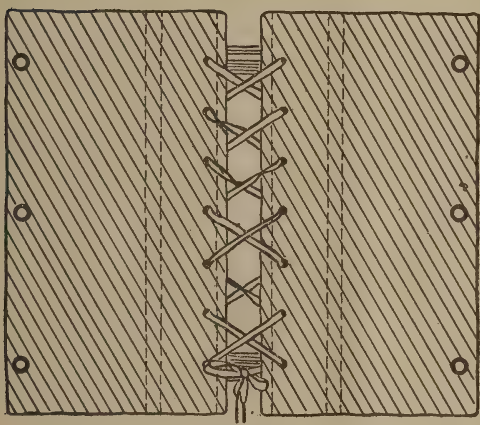


FIGURE 4

In the third (Figure 5) hooks and eyes take the place of buttons.

In the fourth (Figure 6) ribbons tied in bows hold the fabric in place, and the fifth (Figure 7) holds leather or a heavy cloth and shoe buttons, which require the use of a buttonhook.

The fabric to be fastened by lacing should have eyelets; otherwise the child will work to great disadvantage.

When a frame is given the child he should be shown the process of buttoning or lacing, as the case may be, then be left to repeat what he has seen done. It is a good plan to leave two or three of the pieces of cloth partially buttoned, to leave one bow of ribbon tied and two or three of the hooks fastened.

The child, if left to his own devices, will conquer each frame. *Under no circumstances should he be assisted in performing his task.* When the child has learned to button and unbutton the pieces of cloth, he will begin to experiment with his own clothing and will soon proudly inform his mother that he does not need any assistance in dressing.

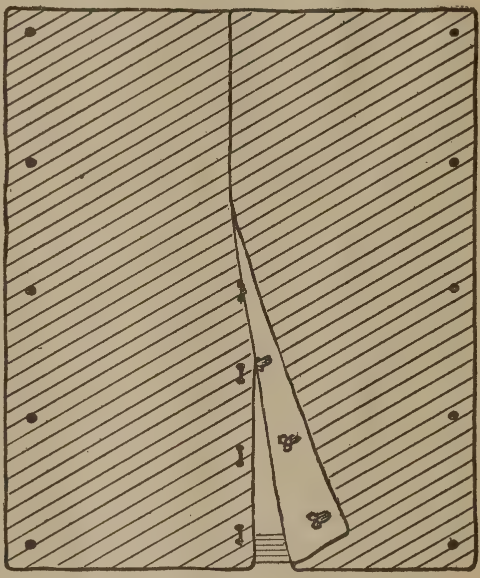


FIGURE 5

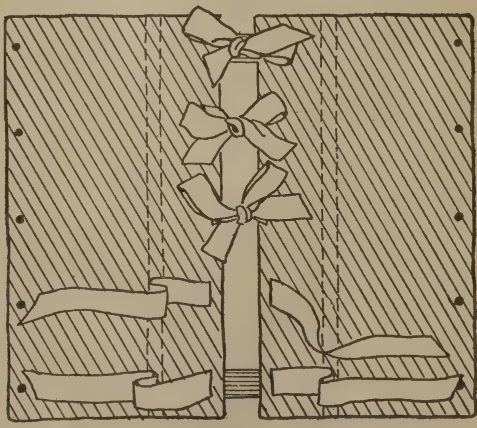


FIGURE 6

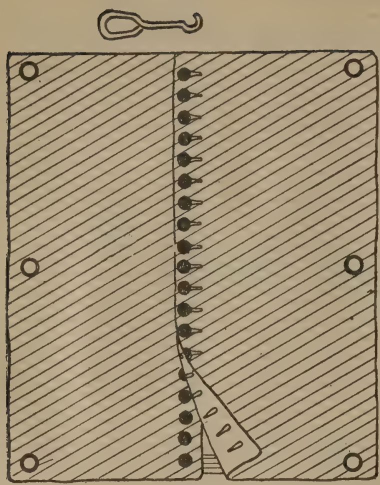


Figure 7

The care of plants and pets also affords excellent means of training the child in muscular development. In the case of plants, it teaches the child to look forward to something in the future, as the springing of the plant from the seed or the development of a bud into a flower.

In the Houses of Childhood this training is still further advanced by certain duties required of the children. In the morning they sweep the room, dust all the furniture and arrange it for the work of the day. Each day a number of children are selected to serve the lunch. They set the tables, bring in and serve the food. In a short time these children acquire a degree of skill in handling domestic utensils that many an adult housekeeper does not possess.

What is done in the House of Childhood can be done in the home to a greater or less extent, if the mother will exercise the necessary patience and give the required directions and encouragement, and the gain to the child and home is worth far more than it costs.

Concerning this training, Madame Montessori says: "Who does not know that to *teach* a child to feed himself, to wash, and dress himself, is a much more tedious and difficult work, calling for infinitely greater patience, than feeding, washing and dressing the child one's self? But the former is the work of an educator, the latter is the easy and inferior work of a servant. Not only is it easier for the mother, but it is very dangerous for the child, since it closes the way and puts obstacles in the path of the life which is developing.

Sight. Touch is a valuable aid to the sight. One of the first exercises in training the sense of sight leads to the visual perception of difference in dimensions.

The apparatus for these exercises consists of three cases of blocks. In the first (Figure 8) ten holes, varying in diameter by one-half centimeter, are bored to the same depth. In each hole is

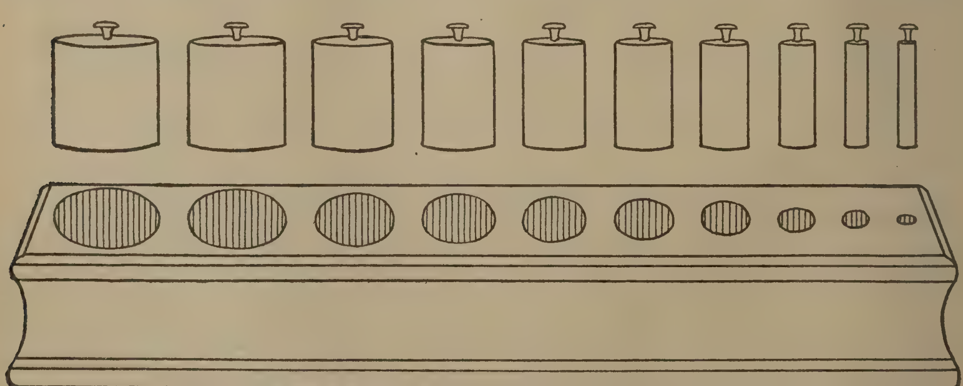


Figure 8

placed a wooden cylinder exactly fitting it. The cylinders have a knob at the top for convenience in handling.

The child is given the block and the cylinders beside it on the table. His task consists in placing the cylinders in their respective holes. He may require several trials before he succeeds, but after a little practice he can place any cylinder in its socket at a glance.

In the second block the holes are all the same diameter, but of different depths, with cylinders to match. In the third block the holes and cylinders vary in both depth and diameter. In working with these objects by himself the child learns the difference between height, depth and size.

The idea of thickness is gained by a set of blocks varying in thickness from one to ten centimeters, each succeeding block increasing in thickness by one centimeter.

Length is taught by a series of ten rods; the first is one meter and the last one decimeter long, the intervening rods varying in length by one decimeter. The decimeters on each rod are painted alternately in different colors, as red and white.

A series of ten wooden cubes (Figure 1), varying in diameter from one centimeter to ten, is used to teach larger and smaller.

With these different series of blocks, including cubes and prisms, many games are played, all of which help to fix in mind the idea for which the particular series of blocks was designed. (Figure 9.)

The visual perception of form is taught by the use of geometrical forms and tablets, containing pockets into which the forms are to be fitted. (Figures 10 to 19.) Here again touch aids sight. The finger is moved lightly around the form and then around the pocket, the child trying one form after another until he is able to fit them all into their places. When a number of forms are indiscriminately mixed in a pile (Figure 20), it requires considerable study for the little one to place them all properly, and several attempts may be necessary to the completion of the tasks.

These tablets can easily be cut from cardboard by using the models illustrated in these pages. The mat should be of one color and the form to be set in it of another.

Color is taught by the use of cards wound with silk of various shades, which the children are taught to arrange in the order of gradation and also to match.

RESULTS

If the foregoing exercises receive proper supervision, the following results should be secured:

1. **Vocabulary.** The child should learn the names of the objects along with their use. When the child is given an object he should be told its name, as square, circle, cube. Only the name should be spoken, and then it is associated directly with the object.

Sometime after the exercise a test should be made to ascertain whether or not the child has associated the name

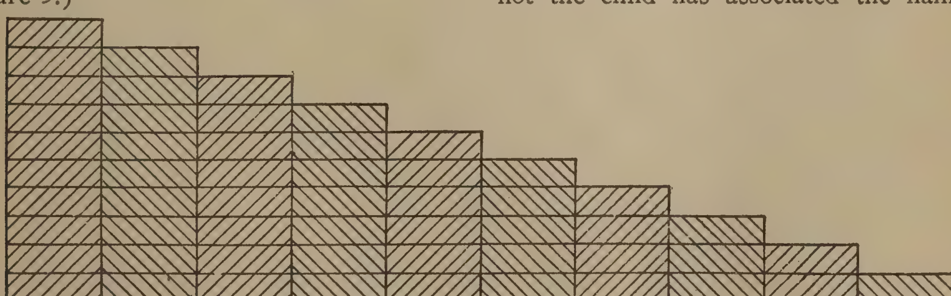


Figure 9

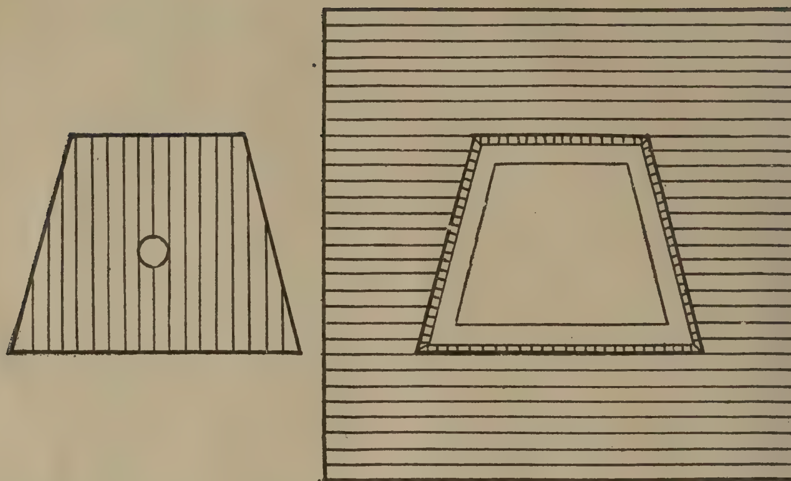


FIGURE 10

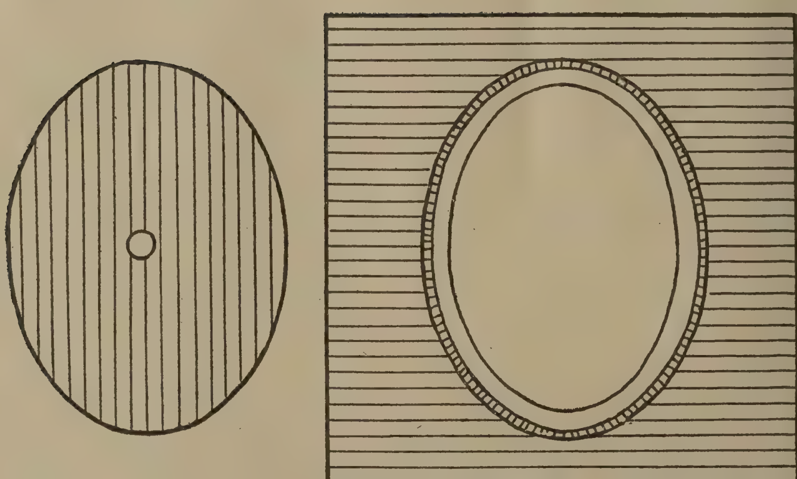


FIGURE 11

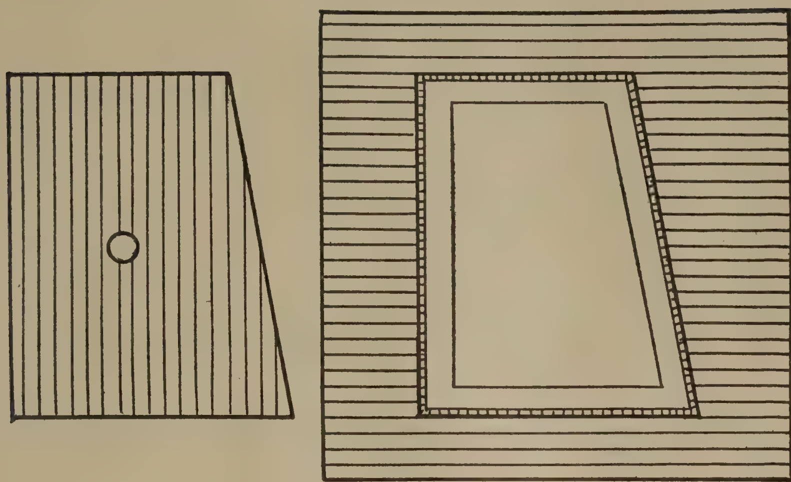


Figure 12

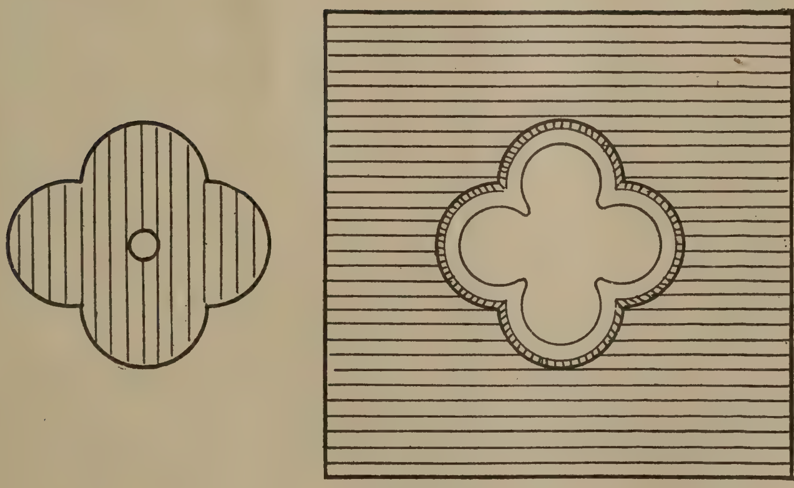


Figure 13

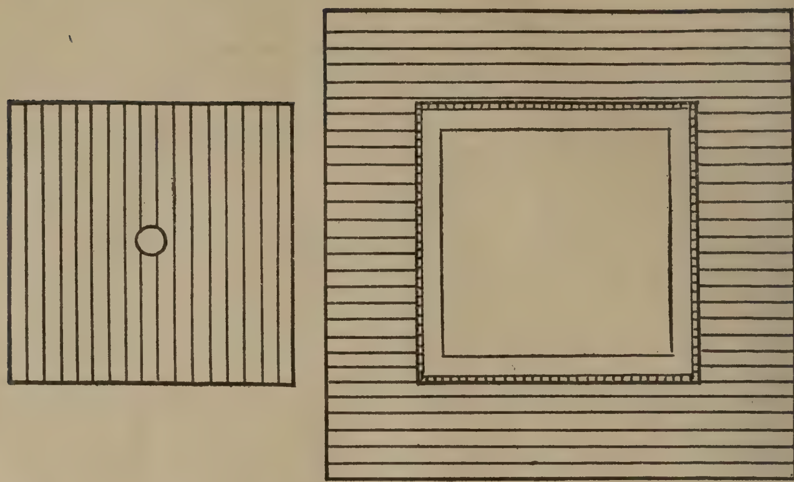


FIGURE 14

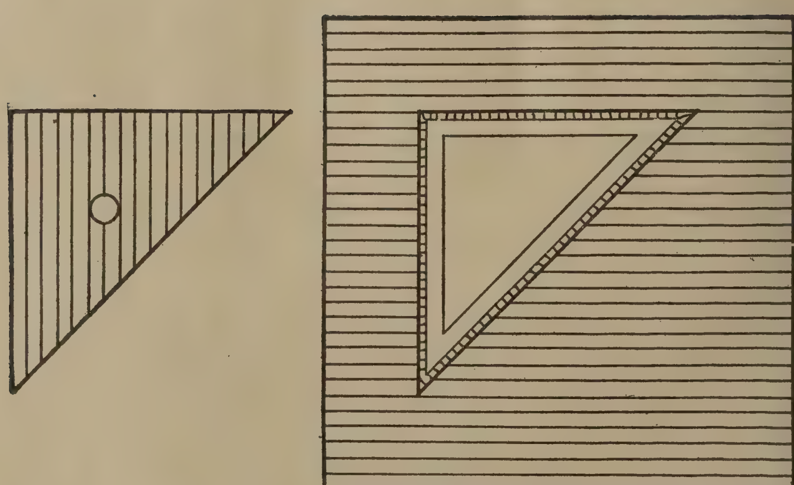


FIGURE 15

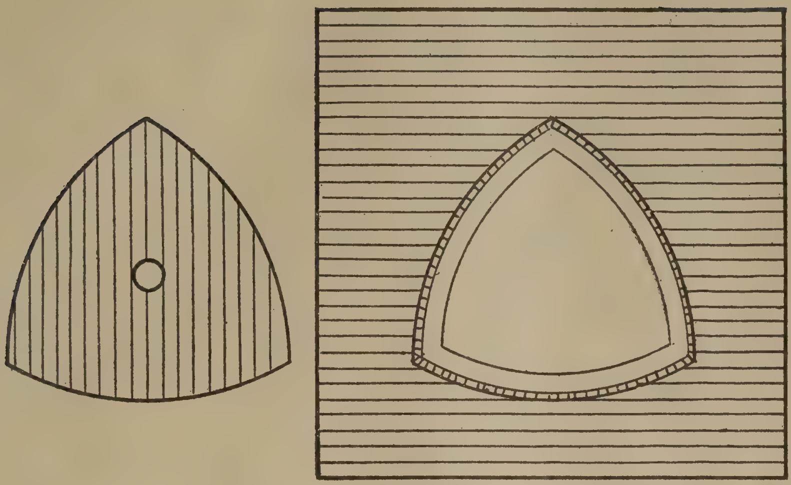


FIGURE 16

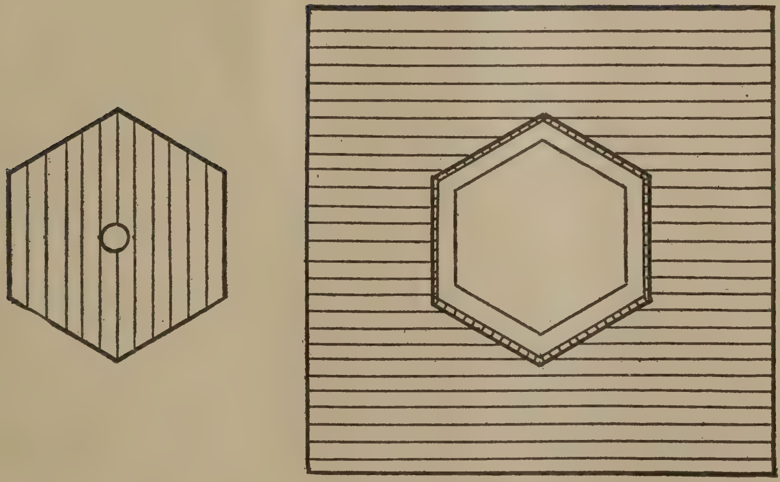


FIGURE 17

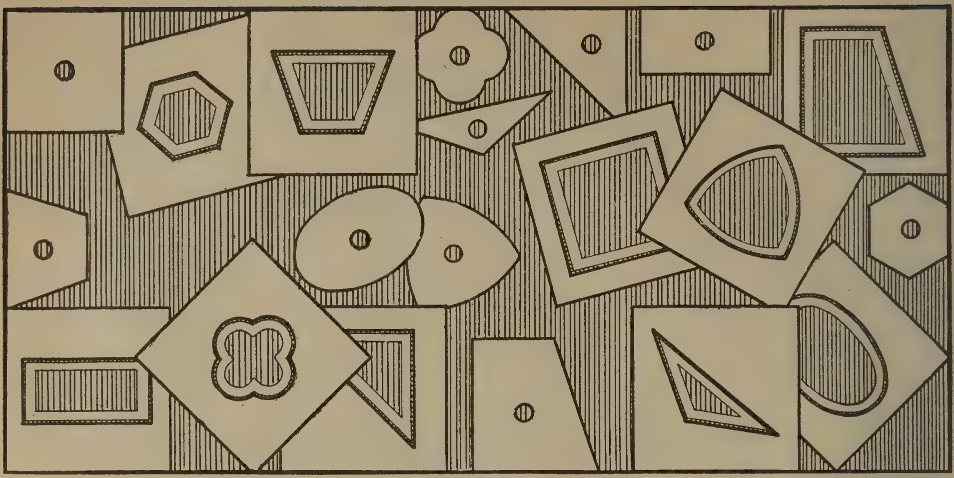


FIGURE 18

with the object. If he has not, it is evident that he was not ready for the exercise when it was given.

2. **Motor Activity.** If the name is associated with the object in the child's mind, he may be led to pronounce it by asking, "What is this?"

3. **Progress.** The proper use of this exercise leads to the child's intellectual development through his spontaneous activity. He gives himself an abundance of practice in everything he has learned, and through this practice learns many other facts. This is the best sort of training for the early years of childhood.

WRITING

Prepare a child for an exercise before giving it and you will experience no difficulty in the desired result.

For generations teachers and parents have struggled with the problem of teaching children to write, when if led up to the act in the proper way the child teaches himself, and the discovery that he can write is one of the greatest joys of his early life.

Training the sense of touch and the development of muscular control associated with this training indirectly lead to the movements that result in writing.

In tracing the geometric forms with his fingers the child has learned design, and from design to graphic language or writing is an easy step. "The child designs, then writes."

The process is so simple that we wonder why someone had not thought of it before. It consists of three steps:

1. Securing the necessary muscular control for forming the letters. This is done by making large letters in script form and pasting them on cardboard, placing only one letter on a card. The letters should not be less than three inches high and should be in the form of flowing script. They should be made of stiff paper or cardboard, of pleasing colors.

With each letter there should be a picture of some object whose name begins with the letter.

The first exercise consists in teaching the pupil to move the tip of his forefinger over the letter just as the hand moves in writing it. Begin with the letters most easily made, as *o*, *a*, *l*, and then proceed to analogous forms.

Let the exercise be repeated many times until the pupil's muscles become habituated to the movement.

2. Securing position of the hand for holding the pencil.

This is done by having the pupil repeat the former exercises, touching the letters with the ends of the first and second fingers.

Repeat these exercises until the pupil can readily hold his hand in this position.

3. Holding the pencil.

A stick the size of a pencil is now placed in the pupil's hand and he has a few exercises in tracing the letters with this. This is followed by the pencil and writing. After tracing with the stick the pupil will discover that he can write and use the pencil of his own accord.

By these exercises the child learns to write in a natural, easy manner, and his writing is free from those cramped positions and laborious movements so common in the lower grades of most schools.

LAW AND CHARACTER

Men do not make laws. They but discover them..... That state is most fortunate in its form of government which has the aptest instruments for the discovery of laws.

Courts are established not to determine the popularity of a cause, but to adjudicate and enforce rights. No litigant should be required to submit his case to the hazard and expense of a political campaign. No judge should be required to seek or receive rewards...... When the trial of causes goes outside the courtroom, Anglo-Saxon constitutional government ends.

Industry, thrift, character, are not conferred by act or resolve. Government cannot relieve from toil. It can provide no substitute for the rewards of service. It can care for the defective and recognize distinguished service. The normal must care for themselves. Self-government means self-support.

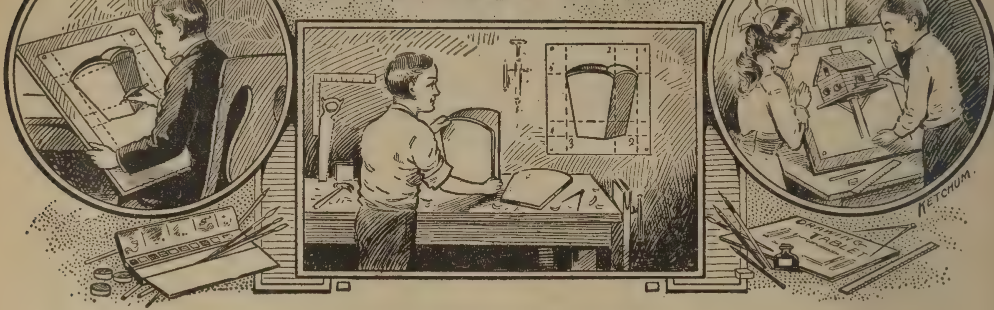
Diffusion of learning has come down from the university to the common school—the kindergarten is last. No one would now expect to aid the common school by abolishing higher education.

Expect to be called a stand-patter, but do not be a stand-patter. Expect to be called a demagog, but do not be a demagog. Do not hesitate to be as revolutionary as science, or as reactionary as the multiplication table. Do not expect to build up the weak by pulling down the strong.

We need a broader, firmer, deeper faith in the people. A faith that men desire to do right, that the commonwealth is founded upon a righteousness which will endure, a reconsecrated faith, that the people must approve, not demagogs, slavishly pandering to their selfishness, merchandising with the clamor of the hour, but real statesmanship, ministering to their welfare, representing their deep, silent, abiding convictions.

—*Calvin Coolidge.*

DRAWING



INTRODUCTION

A Medium of Expression

Man has three mediums through which he expresses thought: language, number and drawing.

Whoever is deprived of any one of these mediums has his power of expression limited.

Drawing was the oldest means of recording ideas. Long before the art of writing was known, crude pictures were used to convey ideas to others, and to preserve them for future generations. In course of time these pictures were organized into a system, which became the picture writing of the ancients. See HIEROGLYPHICS, page 1316.

Not only is drawing a natural medium of expression, but it is also a medium which, in many instances, cannot be replaced by any other, and its practical value is almost beyond estimate. He who with a few strokes of the pen or pencil can clearly present an idea in graphic form has the power to make us grasp ideas which one without this power often fails to impress upon our attention.

Observation

Drawing is one of the best means of training the power of observation. One must see clearly the object to be represented, and this requires the most careful observation.

Study of the Beautiful

No other branch in a course of study is more valuable than drawing for training the hand and the eye.

But drawing is also valuable for its contribution to the æsthetic culture of the student. Nature is full of beauty, and he who reproduces her forms discovers this fact, and learns to look for the beautiful in everything he sees.

Practical Utility

Every craftsman must first construct a mental picture of the thing he is to make. If he can reproduce this picture in a drawing, the drawing is a practical guide to his work. Drawing is necessary not only to the architect, the smith and the carpenter, but to the farmer as well.

The following pages contain the fundamental principles of drawing, together with exercises for practice. Anyone who thoroughly masters the work here presented will acquire a knowledge of drawing which will enable him to make drawings of those objects he wishes to construct.

Apply this knowledge to the building of a birdhouse (page 3244), a chicken house (page 3880), a barn (page 3733), and so on.

Why So Few Persons Can Draw

If drawing is of so great value, why do so few persons possess this accomplishment?

More attention is given drawing in the public schools than ever before. Still, with the efforts now being made, many pupils leave school without having acquired the ability to express themselves through the brush or the pencil.

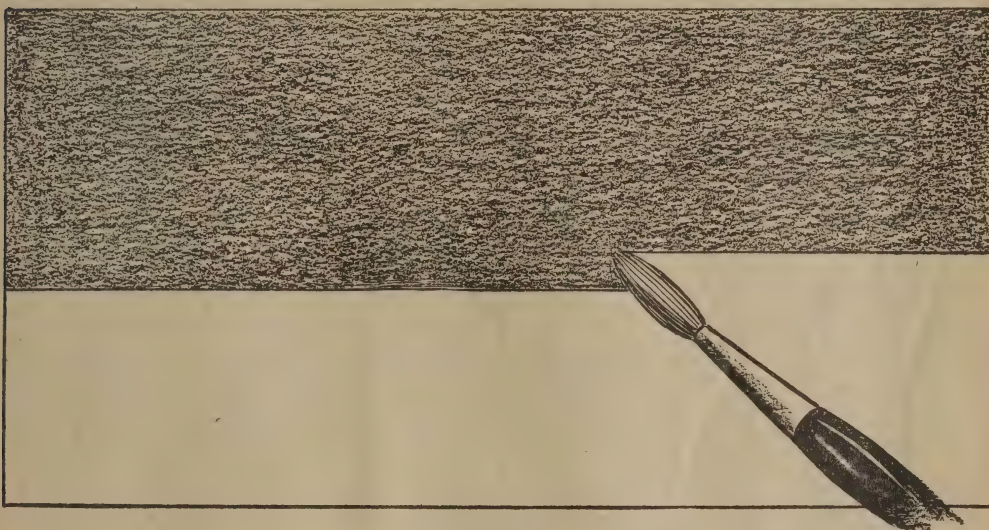


FIGURE 1

The brush should be filled with the wash, and in laying it on, the hand should move with light, swift strokes from left to right.

There are some reasons for this condition, and among them we venture the following as obstacles that should be removed:

1. *Difficult Work.* Exercises are often given pupils in the lower grades which are entirely too difficult for them, and they lose interest in the lessons.

2. *Unjust Criticism.* Many teachers are prone to view the work of the child through the eyes of the adult, and magnify the child's faults, when they should praise him for what he has done.

3. *Failure to Apply.* Drawing in school and in the home should be looked upon as a means to an end, and the practical application of its principles to the affairs of everyday life should be constantly emphasized.

4. *The Belief that Only Artists Can Draw.* Altogether too many people have the idea that drawing is an accomplishment for artists only, and overlook entirely its value as a medium of expression. Not all can be artists, but there is not a normal boy or girl in the land who cannot learn to draw.

FIRST LESSONS

Material

But little material is needed, and this is all inexpensive. For young children the outfit would include the following: manila drawing paper, 6″ by 9″ and 9″ by 12″; No. 7 brush; set of water colors containing the three primary colors, red, yellow and blue; bottle of common ink, or, preferably, one of India ink; scissors; paper for cutting.

If the 9″ by 12″ drawing paper is procured, the 6″ by 9″ can be made from it. One package will last one child for a long time. Colored paper of various shades

for cutting and folding and a pot of paste will enable the teacher or mother to give the child a greater variety of exercises, but they are not essential at the beginning.

Use of Material. Show the pupils how to prepare the work by pouring a little ink into a shallow dish and then adding water so it will not be too dark. Direct them to take a 6″ by 9″ sheet of drawing paper and lay the wash on, holding the brush as in Figure 1.

It will be well to let them practice this exercise two or three times before giving them an object to reproduce.

With young pupils patience and gentleness are necessary to secure the best efforts. Always find something to commend in what the pupil does. Point out defects and suggest how they can be remedied.

Figure 4 A

Encouragement is far better than censure. It causes the pupil to put forth his best effort.

Figure 2

Figure 3

Grasses

Select a single stalk of a simple grass or grain and place it in such a position that the pupil can see it well. Then let him reproduce it as nearly as he can. Each part of the plant should be made with a single stroke of the brush (Figure 2). The next exercise may be a little more complex (Figure 3). Then a number of stalks can be tried (Figure 4A and Figure 4B).

The study of these figures will be of value to the teacher as well as the pupil. Note the points of difference which lead to different modes of treatment.

Every plant, every spray even, has its individuality, which the student of nature and the artist always discover. This variety midst apparent unity lends a peculiar charm to the study of natural objects, and if pupils can be led to discover this charm it adds much to the interest of the drawing lessons. The teacher who through her own interest and enthusiasm can indirectly develop this love of nature in her pupils is bound to succeed.

Figure 4 B

Trees

Children readily grasp the form of a large object. Let them study a tree, then reproduce it in mass (Figure 5). If the tree is an elm the drawing will resemble Figure 6.

Exercises 2 and 3 will furnish material for abundance of practice. Interest can be sustained by selecting new objects for each lesson. When the interest begins to wane lessons of another sort should be substituted.

Grasses with twisted blades (Figure 7) are more difficult than any of the preceding exercises, and should not be used until the pupils have acquired considerable facility in the use of the brush.

FIGURE 6

In the first exercises on this tree it will be well to let the pupils paint the trunk and crown in mass. They can begin to bring out details after they are able to make the form as a whole.

LESSONS IN COLOR

Use of Material

After the children have had some experience with the brush and ink they may be given water colors. The instructions that were given when they began the use of ink should be repeated. It will require some practice before the children are able to prepare washes of the desired shade. Let them first make a blue wash and lay it over the upper half of a 6″ by 9″ sheet. Then let them make a yellow wash and lay it over the lower half of the sheet. The boundaries separating the washes should form a straight, horizontal line.

FIGURE 5

Cutting or tearing the form of this tree from paper will aid the pupils in gaining an idea of its shape, and assist them in reproducing the form with the brush.

Landscapes

1. For the next exercise let them lay the blue wash over the upper half of the sheet and a green wash over the lower half.

Give such directions as will enable the pupils to make the green wash from the colors used in the preceding exercise. Let the children call the blue, sky, and the green, grass. They now have the foundation for a landscape.

2. For the next exercise let the children paint into the landscape some of the trees they reproduced

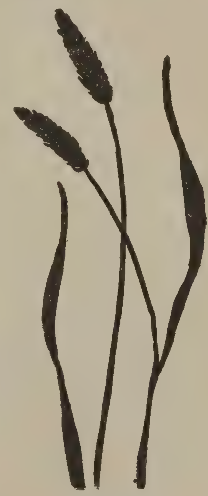


FIGURE 7

Because of the peculiar shape of the blades in this grass, it is more difficult to draw than at first appears.

in ink. By mixing a little red with the green they will form a brown for the trunks and larger branches of the trees.

3. For the following exercises let them draw in color the grain they drew in ink, or substitute new grasses, provided they are not too difficult.

PAPER FOLDING AND CUTTING

Children are always interested in making things.

"Let me do it" is the ever-recurring request of the child when he sees his elders performing some task that interests him.

The earlier this desire can be gratified the better it is for the child and the home.

Fortunately the means and material are always at hand. Any paper that tears easily (old newspaper will answer) serves the purpose; an interested mother or teacher is the guide, and the nimble fingers of the child are the tools.

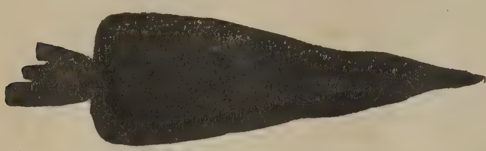


FIGURE 8

This form is easily made with fingers or scissors.

Paper Tearing

Let the child tear from paper, representations of familiar objects in which he is interested; a cat, a dog, a rabbit and a house are good illustrations of the objects that can be imitated.

The first results will, of course, be very crude, but they will not seem so to the child, and these preliminary exercises prepare the way for something more definite later on.

Paper Cutting

Use white dodger, manila or any other cheap paper that is convenient.

Simple Forms. Let the children cut representations of simple forms, such as a carrot (Figure 8). They will succeed better by making the forms medium size, about three or four inches long for the carrot, and of corresponding dimensions for other objects. The apple (Figure 9) is another good object with which to begin. For symmetrical objects folding

FIGURE 9

The form of the apple is not symmetrical; therefore it cannot be made by folding the paper and cutting. The successful making of this form is evidence of careful observation and a trained hand.

must precede cutting. The squash (Figure 10) is a little more difficult, but the children will soon conquer it.

Other simple objects will suggest themselves. The children are often more fruitful in discovering such objects than the mother or teacher.

More Complex Forms. Children are more interested in pets than in any other objects, and they are always interested in

FIGURE 10

The pumpkin is always of interest to children. After they have made it by cutting from paper, let them reproduce it in color.

cutting kittens, chickens and other domestic animals. The cat may be represented in three characteristic positions: sitting (Figure 11), at play (Figure 12) and showing anger or fright (Figure 13).

FIGURE 13
This cat is anxious for a fight.

FIGURE 11
This cat is contented.

FIGURE 14

The cow and the horse may also be used (Figures 14 and 15).

FIGURE 12
This cat is happy.

FIGURE 15

FIGURE 16

This picture is made by cutting the hen, chickens and other objects from dark-colored paper, then pasting them on to a lighter-colored paper for a background.

Hen and chickens are easily represented (Figure 16).

If a squirrel lives about the home or the school, the children will soon catch its many beautiful poses and try to reproduce them (Figure 17).

FIGURE 17

This pose of the squirrel is only one of a number that the children will discover and be interested in reproducing.

FIGURE 18

Huge in bulk, clumsy in appearance, but always interesting.

Other animals, such as the elephant and the camel, are also interesting to the children (Figures 18 and 19).

FIGURE 19

The "ship of the desert." Why is the camel given this name?

Figures of children in action are also easily reproduced. Letting one of a group of children pose and the others cut the pose is often an interesting game (Figures 20 and 21).

FIGURE 20

Reproduction of such figures as this in ink or color is also a good exercise.

FIGURE 21

Cut the figures separately and paste them on a light background to make the picture.

Interesting picture stories can also be made by cutting paper (Figure 22). (This represents Jack and Jill.)

FIGURE 22

JACK AND JILL

Mounting. The interest of the children in these exercises will be increased and prolonged if they are allowed to mount their cuttings. Use a gray or brown paper that will form a strong contrast with the paper used for the cuttings. This brings the objects out clearly.

Other Exercises. The above exercises are suggestive of many others which can be given. Let the exercises increase in difficulty as the children's skill increases, and the interest will be sustained.

A piece of stiff cardboard or a light drawing board to which the paper can be fastened enables the pupil to place his paper in proper position in relation to the eye. This board should be raised at the farther end so that the paper will be at right angles to a line connecting it with the eye.

General Directions

1. See that the pencils are properly sharpened. The point should be somewhat blunt and the wood whittled away from the lead about a quarter of an inch.

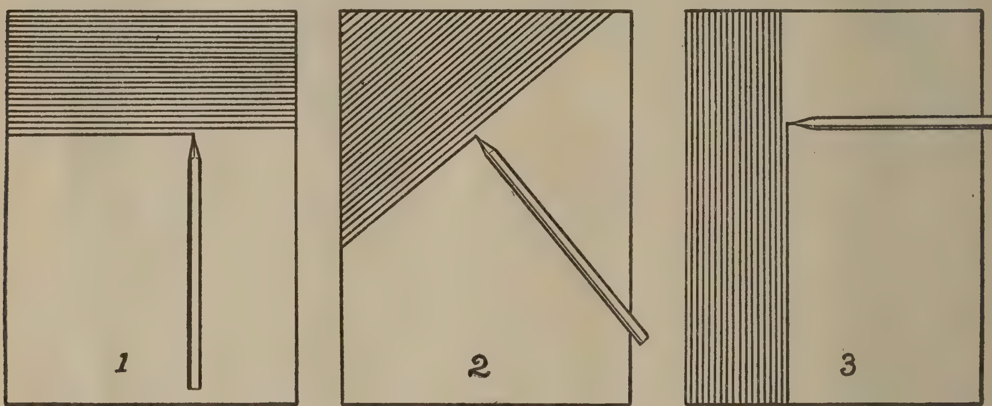


FIGURE 23

The pencil should move from left to right; never back and forth on the paper.

2. Exercises in holding the pencil should precede exercises in drawing objects.

The pencil should always be at right angles to the line (Figure 23, 1, 2 and 3); 1 shows the correct position when drawing horizontal lines; 2 shows the position for oblique lines; 3 shows the position for vertical lines.

3. Every object has form, and the chief purpose of drawing is to acquire such skill as will enable one accurately to represent that object on a drawing.

One cannot draw what one does not see; therefore careful observation of an object should precede any attempt to draw it.

4. Everything has a place. When drawing an object alone even its posi-

DRAWING WITH THE PENCIL

The exercises already described may be considered as preliminary to drawing with the pencil, or they may be interspersed with pencil exercises. Whatever the plan adopted, we must always bear in mind that the pencil exercises are of the greatest importance, for they constitute the foundation of drawing. These exercises should include the study of form, position, direction or surface and composition.

Material

A soft pencil of good grade such as an S. M. Dixon or No. 2 Faber is the best for ordinary work.

Manila drawing paper, the same as that used for brush and ink or watercolor work, is equally suitable for pencil drawings.

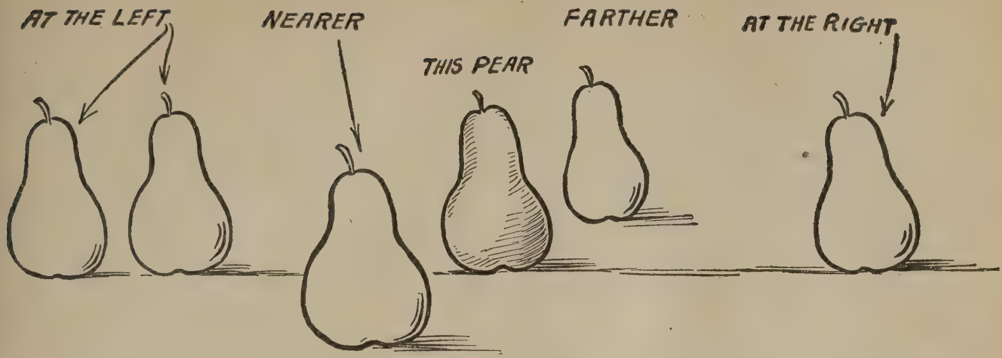


FIGURE 24

Is the same pear represented in each drawing? If so, why is it larger in some positions than in others? Which pear is the farthest from the eye?

tion on the paper should receive attention, and when there are several objects in a group their relative positions must be given careful consideration, or the picture will not be pleasing. In determining relative positions select one object with which the others are to be compared. The other objects will be at the left, at the right, nearer and farther than this object (Figure 24).

Exercises in grouping reveal the pupil's artistic taste. Much practice should be given in this line of work. Select different objects and allow the pupils to arrange them, assigning the task first to one and then to another until before the exercises are concluded each member of the class has been given the opportunity to arrange the objects. Hang the drawings up where they can be studied by the class

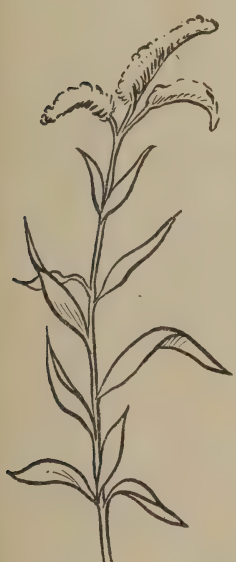


FIGURE 25

Compare these grasses (Figures 25 and 26) with those in Figures 2, 3 and 4, and notice that the difference lies largely in the treatment. Those first figures furnish equally good material for pencil drawings.

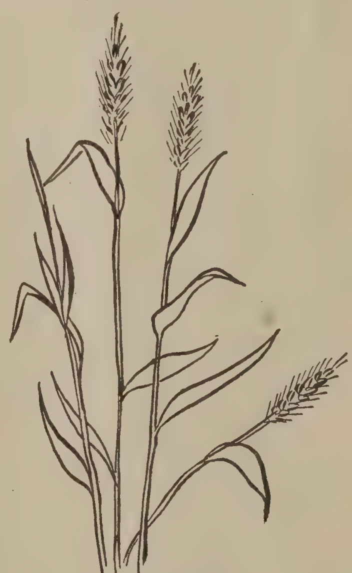


FIGURE 26

Simple Drawings

1. *Grasses.* Select a stalk of grass or grain and let the children draw it. Each child should have a stalk; consequently each drawing will be different. Each pupil, however, should have the same sort of grass (Figure 25).

FIGURE 27

This and Figure 28 show what the pupils should attempt in sketching leaves. As far as possible have them collect the leaves used in the drawing lesson.

FIGURE 28

Compare the veining in the maple leaf with that in the leaves in Figure 27.

Single stalks may be followed with clusters of stalks (Figure 26).

2. *Leaves.* Leaves are easily drawn and serve the purpose, giving a variety of forms in flat surfaces (Figure 27).

The maple leaf may make a study by itself (Figure 28).

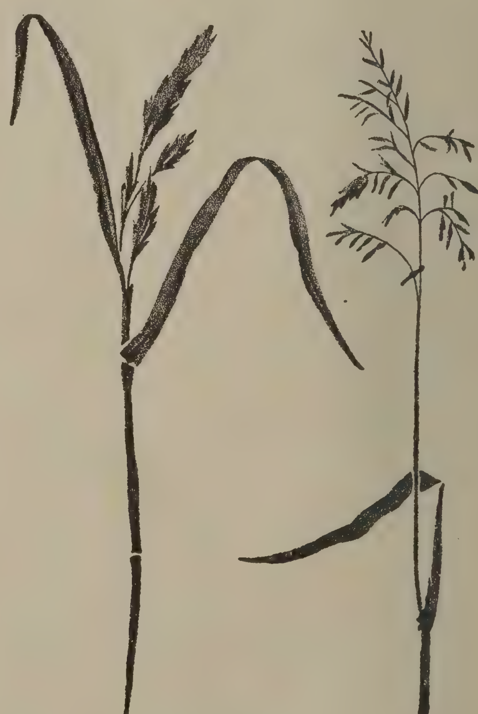


FIGURE 28 A

Figure 28 A is a solid or shaded drawing of grasses in pencil.

FIGURE 28 B

Figure 28 B is a reproduction in ink given here to show the contrast between pencil and ink work.

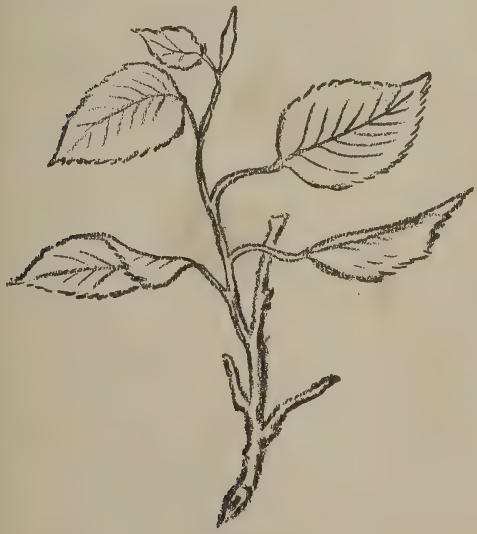


FIGURE 29

Branches from all the different trees and shrubs in the locality should be drawn. Let the pupils procure the material for these lessons.

3. *Branches.* Branches of trees furnish excellent material for beginners. At first select a simple branch with few leaves (Figure 29).

4. *Flowers.* In the spring the pussy willow is a pleasing subject (Figure 30).

FIGURE 30

The willow can be reproduced with equal success in pencil or in ink.

A simple spring flower like the trillium can also be used (Figure 31). The adder's tongue is also equally interesting (Figure 32).

5. *Other Exercises.* The foregoing exercises show what can be done with simple natural objects. More difficult objects should be introduced as fast as the children are prepared for them. The variety of subjects is endless.

FIGURE 31

The trillium is one of the most fascinating of the early spring flowers. It is also an excellent subject for pencil drawing and for a study in color.

LINES

Lines represent action and repose. "Each line," says Augsberg, "has a leading expression of its own that is of vital and far-reaching use in action drawing." To illustrate:

Vertical lines may express stillness, as in lines representing the side of a house, or vertical motion, as in a waterfall.

Horizontal lines indicate repose or action in horizontal direction.

Oblique lines, more than any others, represent action. Children like to call them the "go" lines.

Curved lines represent grace and beauty.

Angular lines represent disorder or violent action.

Parallel lines represent order either in repose or in action. When used to express action they indicate uniform motion.

Successful line drawings expressing these ideas show both aptitude and skill. Of course, the greater the aptitude the sooner the child acquires the skill, but all children can acquire sufficient skill to enable them to make successful line drawings, and this is a feature of the work which they enjoy.

Accenting. Accenting in drawing when applied to lines means about the same as when applied to syllables in the pronunciation of words. A correct representation of an object in outline requires the making of some lines stronger than others. In general, lines representing the parts of the object nearer the eye are stronger than the others. This is especially necessary when objects having depth are represented.

Another use of accenting is to show the parts of the object in the shadow, by making the lines on that side a little heavier.

Accenting is a good test of the pupil's ability to express in lines what he sees. By proper accenting the object is reproduced as it appears and is made to stand out boldly on the paper.

FIGURE 32

Give the adder's tongue the same treatment as the trillium.

Exercises

These exercises are of special importance because they show so clearly the value of lines. Each line should be made with a single stroke of the pencil, and, like the words in a sentence, all are necessary to express the thought. Our greatest cartoonists are very skillful in this style of drawing.

1. *The Human Figure.* Begin with the human figure (Figure 33).

The figures in group A are quite easy to draw.

The figures in group B indicate intense action.

2. *Animals.* Draw animals in a similar manner, expressing as many poses as possible (Figure 34).

3. *Birds.* Try an exercise with birds (Figure 35).

4. *Practice.* The children should have much practice on exercises of this sort, since they are of especial value in training the hand and eye.

Suggestions

The following suggestions will be found helpful in securing the desired results in line drawings.

1. *Make the Lines Expressive.* The tendency of those without experience is to make smooth finished lines. A glance at the figures on this and the following pages will show at once that such lines would be wholly out of place in this style of drawing. The lines should be bold, strong and expressive.

2. *Arm Practice.* All the figures in these exercises contain curved lines. In each instance the right curve is essential to the correct posture of the figure. Making these curves in the air will assist very materially in giving the pupil the necessary muscular control for making them in the drawing.

3. *Feeling.* If the pupil can feel what he is drawing, he will put more life into his sketch. Take the figures in the upper row (Figure 33A) from left

FIGURE 33 A

Study carefully each figure in the group. Notice how expressive each line is. Were any of these lines changed the least in length or direction, the figure in which these changes occurred would lose its chief characteristic.

to right. The first boy is walking, the second and the third are running a race, and the fourth is swimming. Select four boys to impersonate these figures and let each boy draw what he impersonates.

In the next exercise (Figure 33B) the first figure is an Indian. What is each of the others? Finding the answer to this question will cause a most careful study of the figures and also add interest to this exercise.

cases this will show a marked improvement over the first one.

6. *Repose.* Repose is often as interesting as action, though children generally prefer drawings representing movement. Animals in groups, birds in sitting posture, and groups of children can be reproduced with excellent effect after a little practice. The birds are the easiest to draw and the animals the most difficult.

FIGURE 33 B

All on the run. These figures are not so easy to make as you may think at first glance.

4. *Erasing.* Pupils should not be allowed to erase. The practice leads to carelessness in drawing and makes the work mussy.

5. *Redrawing.* After the pupil has made his sketch, he will see how he can improve upon it. Let him make his improvements by drawing new lines over or alongside of the first ones. He may make several drawings one over the other. After the pupil has done his best he should make a new drawing. In most

7. *Use.* Line drawings of this sort can often be used to illustrate written work in language, geography, history and nature study. Such application of the drawing lessons leads the pupils to see their use and to feel that the drawing lessons are not something set apart from the other branches in the course of study.

This point should be emphasized with teachers of rural schools. Patrons of these schools often feel that drawing is a useless fad, a waste of time and a

source of unnecessary expense. The more closely the drawing lessons can be connected with the other work of the school and with the work in the home, the easier it will be for the teacher to overcome this prejudice.

The following suggestions are given with the hope that they will assist the teacher in extending the application of the drawing lesson:

1. Encourage the pupils to make drawings of objects which they wish to construct. At first these must be of simple objects. Boys can easily make drawings for a wagon box, a sled and a door. Girls will become interested in designs for patchwork, aprons and numerous other articles of household utility.

2. Teach the older pupils to draw to scale, as one-half inch to a foot. Boys will soon learn to make drawings that will represent the exact dimensions of the objects they wish to construct. Lead them to see the value of being able to make such drawings. It saves guesswork and many mistakes in the construction of the article. It puts them in the position of becoming their own draftsmen, so that later they can draw plans for houses, barns and other buildings, and thus work out for themselves plans suited to their special needs.

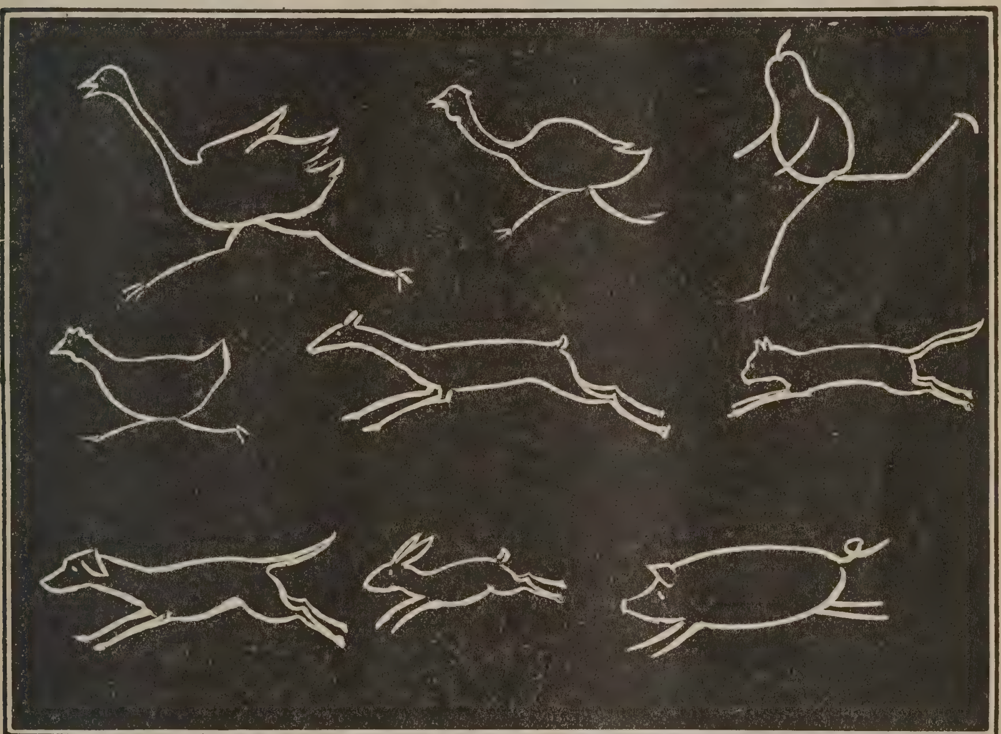


FIGURE 34

This is a good blackboard exercise. It will appeal to every farmer boy who has seen much of it enacted many times. Every line is expressive of action.

Encourage the pupils to combine construction work with drawings. You may not be able to give systematic lessons in manual training, but in almost every home there are tools which boys and girls can use, and with a little encouragement

FIGURE 35

This figure shows how by a few simple lines the graceful poses and movements of birds can be illustrated.

they will take pleasure in bringing the results of their handiwork to school.

4. Make this work as practical as possible. Often a good beginning can be made in the construction of shelves and bookcases for the schoolroom, and the girls can exercise their ingenuity in beautifying the windows and walls.

5. Encourage the boys on farms to make drawings of the parts of tools and implements that need to be repaired, and then to make the part needed, in accordance with the drawing.

6. Make use of the drawing lessons in decorative design. The possibilities under this suggestion are many. In the illustration of cover designs for written lessons in various subjects, especially nature study, geography and history; in the making of decorations for Thanksgiving, Christmas, Halloween and other festivals; in planning designs for decorating the schoolroom and the home; in planning designs for flower beds, lawns and gardens; and in numerous other ways can this suggestion be applied.

PERSPECTIVE

The preceding exercises deal with flat surfaces only. The next step is the representation on a flat surface of objects having depth. This representation is technically called *perspective*. But of this a little more later on.

We must apply the principles of perspective in drawing solid objects, as cubes, prisms and cylinders, and in drawing groups of objects, because the individual objects are at different distances from the eye.

The Horizon Line

To indicate the various distances of objects in a group draw a light horizontal line so as to divide the paper into two parts. Let this line represent the horizon. It is called the *horizon line.*

Draw a series of circles of varying diameters so that the upper part in each circumference touches the horizon line (Figure 36).

What do these sizes show in regard to the position of the objects?

The perspective of objects of the same size can be indicated by drawing the objects in different sizes if the top of each object touches the horizon line.

Draw a group of wigwams representing the same principle (Figure 37).

Follow this with a group of houses and trees (Figure 38).

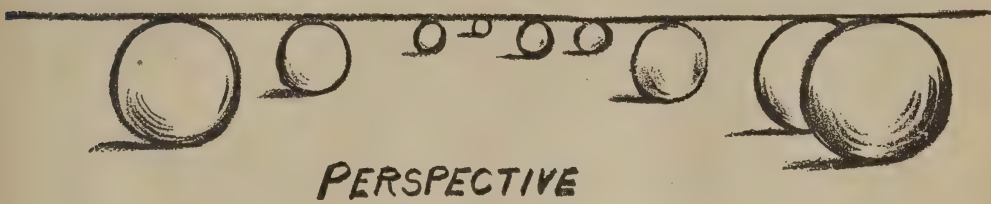


FIGURE 36

This is the simplest plan for teaching perspective, and it can be used long before the pupils are prepared for the more formal principles.

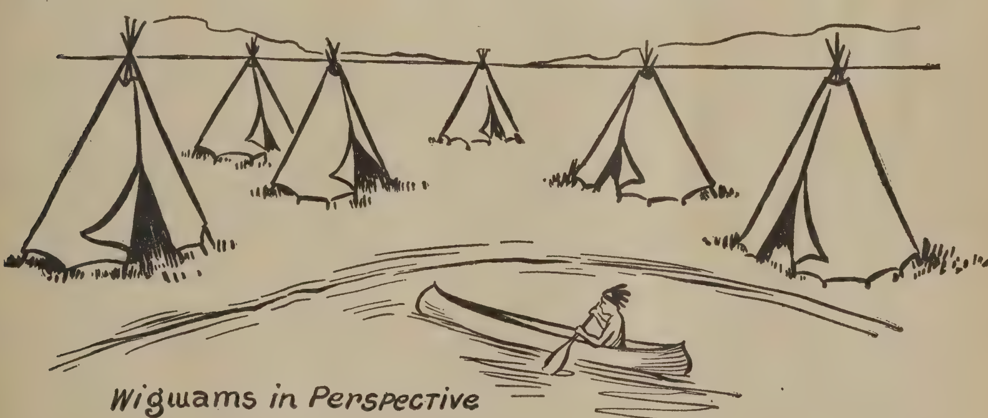


FIGURE 37

This picture is suggestive of many that the ingenious teacher will discover, and children are always interested in drawing sketches of this sort.

Arrange simple objects, as apples, potatoes and vegetables in groups and draw. See how many different arrangements you can make with three objects, and have the pictures pleasing.

Try four objects. Which make the more pleasing groups, three or four?

FIGURE 38

In making a sketch like this, first sketch lightly the lines representing the boundaries of the street. Group the other objects in reference to these lines.

The Vanishing Point

All receding parallel lines converge; that is, they approach each other until they meet at a point. This point is always on the horizon line, and is called the *vanishing point*. The vanishing point may be in front or to the right or the left.

We meet practical illustrations of this principle scores of times every day, but because they are so common, we seldom think of them. The best illustration is a straight railway track extending for several miles. The rails apparently meet in the distance. A long, straight piece of country road, a city street and a forest lane are other good illustrations.

In drawing, the principle is best illustrated by the use of a cube. The cube should be at least two inches in diameter.

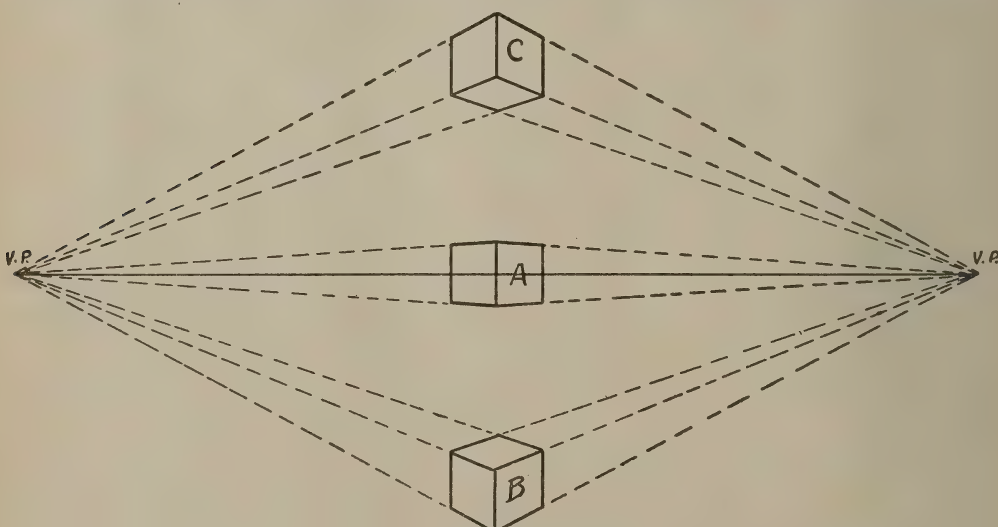


FIGURE 39

This and the following exercises will need to be repeated many times until the pupils become thoroughly grounded in the principles they illustrate.

Figure 39 shows the cube in three positions: A on a level with the eye; B, below the eye; C, above the eye. The vanishing points are to the right and to the left.

This figure should be carefully studied and each line traced from its beginning to the vanishing point.

FIGURE 40

Exercises with the Cube

1. Let the pupil place the cube directly in front on a level with the eye and draw what he sees (Figure 40).

2. Place the cube directly in front below the level of the eye. Draw (Figure 41).

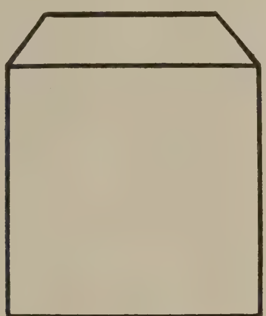


FIGURE 41

Caution. Unless special care is taken with these exercises, the child will use his imagination and draw parts of the cube which he cannot see. Even grown-ups are liable to fall into this error.

3. Move the cube to the left. Draw, prolonging the lines AB, CD, EF (Figure 42).

4. Turn the cube so that the edge will be directly in front. Draw, prolonging the lines AB, CD, EF, AC and EG (Figure 43).

Note. These exercises should be practiced over and over until the children can draw the cube in any position with a fair degree of accuracy.

5. Combine the above exercises (Figure 44).

In what position is each cube in reference to the eye?

What lines should be drawn first? Why?

Practice. Have the children draw the cube in various positions, then erase all blocking-in or continuation lines and criticize their work.

Substitute a rectangular prism and draw it in as many positions as possible.

A box with the cover at an angle of about 45 degrees is an excellent study, and by placing it in different positions a number of lessons can be based upon it.

Caution. Exercises in perspective should train the eye to see objects as they are. In making drawings of the cube and other rectangular solids pupils are tempted to use a ruler and to measure distances with it. This must be avoided.

If the pupil begins to draw these figures by measuring and testing he will never be able to draw free-hand.

Let the pupil study the object in its position, then draw as best he may. He can improve his drawing by drawing over it as in line drawings. He may draw over the original figure several times until he has made a good drawing. He should then redraw this on a separate sheet of paper.

At first the figures will be crude and the lines far from straight, but it is better by far to develop from these crude beginnings perfect drawings by study and practice, than at first to make a perfect drawing by use of the ruler.

We are led to dwell upon this point because of its vital importance. Children, like adults, are prone to follow the lines of least resistance. It is much easier to draw a straight line by using a ruler than to attempt to draw one without such aid. *But the pupil who begins with the ruler will never get away from it.* Its use should not be allowed.

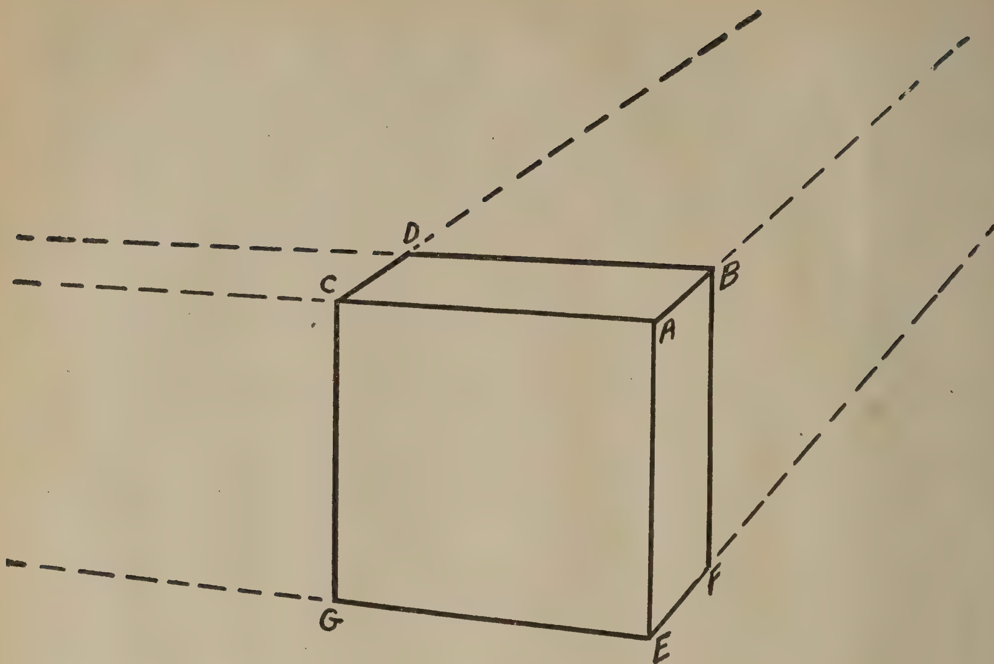


FIGURE 42

Exercises in perspective should be introduced with other exercises or the pupils will lose interest in the work. Have them make practical applications of each principle as soon as they have learned it.

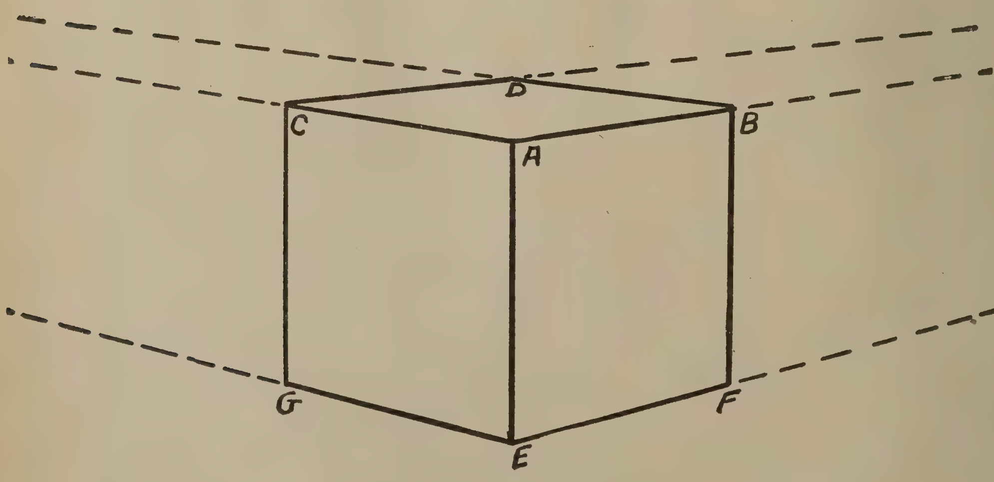


FIGURE 43

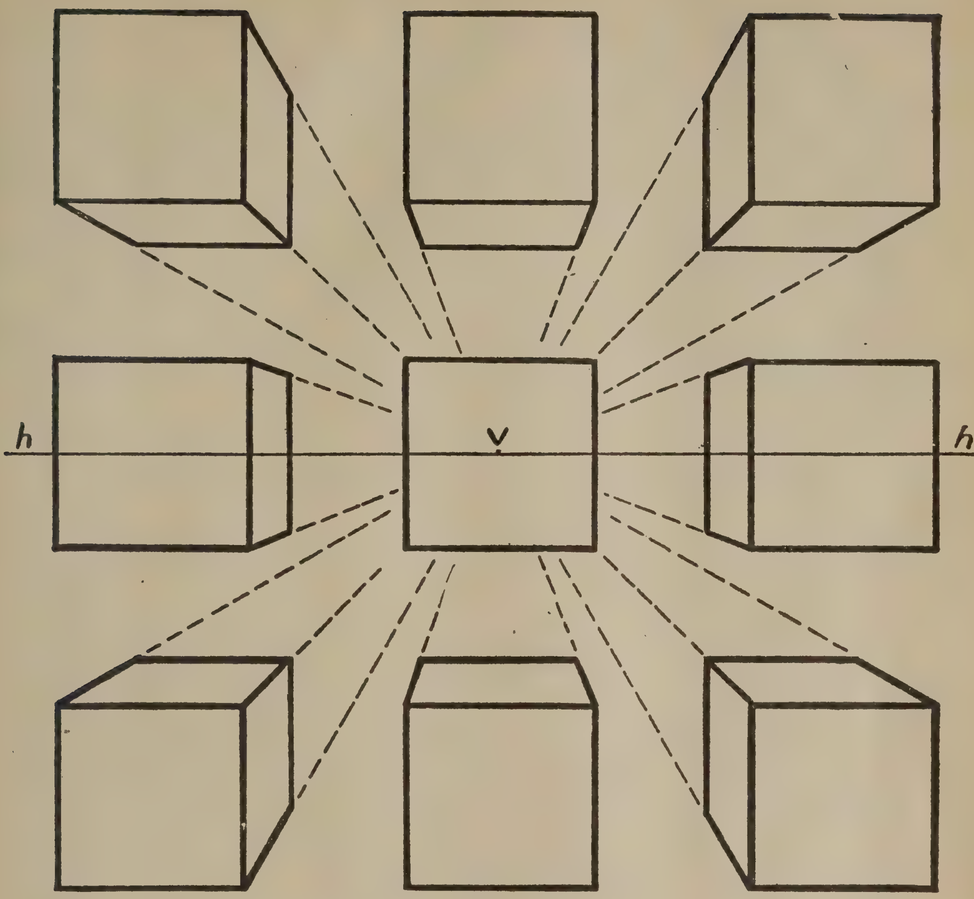


FIGURE 44

In this figure all the principles are combined. After the pupils are able to reproduce this drawing from memory substitute other objects for the cube. If they succeed they have mastered the principles of perspective.

Exercises with the Cylinder

Cut circles two inches in diameter from cardboard and give one to each member of the class.

1. Have the children draw the circle as it appears when held vertically before the eye (Figure 45). (A pair of compasses is necessary to make this drawing.)

2. Lay the circle on the desk or table so that it will be from 12 to 18 inches from the front edge. Draw (Figure 46). Seen in this position the circle appears as an oval.

3. Take a plain tumbler or baking powder can. Place it in front two feet or so away and so that the top is a little below the level of the eye. Draw (Figure 47).

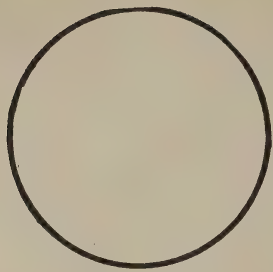


FIGURE 45

In this and the three following figures the principles employed in drawing the cube are applied to the cylinder. Lead the pupils to see the similarity.

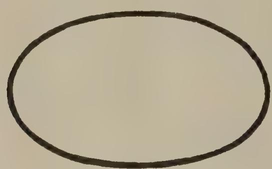


FIGURE 46

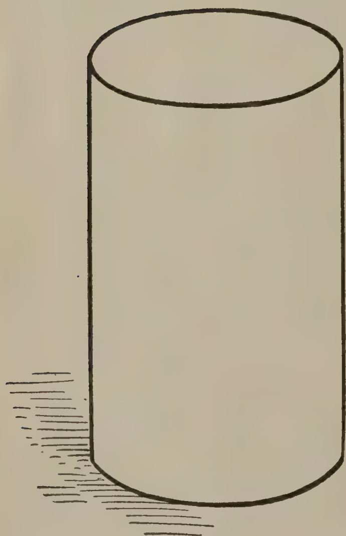


FIGURE 47

4. Lay the cylinder on the side so that one end can be seen. Draw (Figure 48).

These exercises should be practiced until the cylinder can be accurately represented in these positions.

Note. These exercises with the cube, prism and cylinder furnish the training in the principles of perspective necessary to enable one to draw solid objects on a flat surface and also to draw groups of objects, landscapes and all other objects having three dimensions.

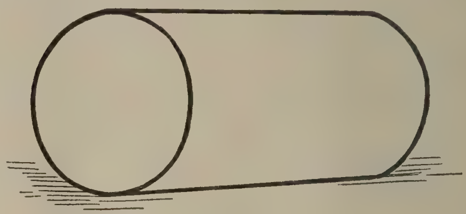


FIGURE 48

Application

The outlines of objects are made up of straight and curved lines; therefore the principles learned in the study of the cube and the cylinder should be constantly held in mind.

1. Begin with simple objects, such as a book, and apply the principles by placing it in different positions (Figure 49).
2. Draw a table (Figure 50).
3. Draw a house (Figure 51).
4. Draw a road or a railway (Figure 52).

OUTLINE DRAWINGS

Apply the principles studied in all the foregoing exercises to drawing objects in outline. The illustrations on the following page are suggestive of what may be attempted.

Let the pupils try one or, at most, two objects at a lesson. As a good review exercise let each pupil choose the object he prefers to draw. Collect the drawings and hang them where all the class can study them.

Let this study be followed by a general criticism by the teacher and pupils in a future lesson. The criticism should point out both the merits and defects in the drawings. It should be so conducted as to give the pupils a desire to improve upon the work.

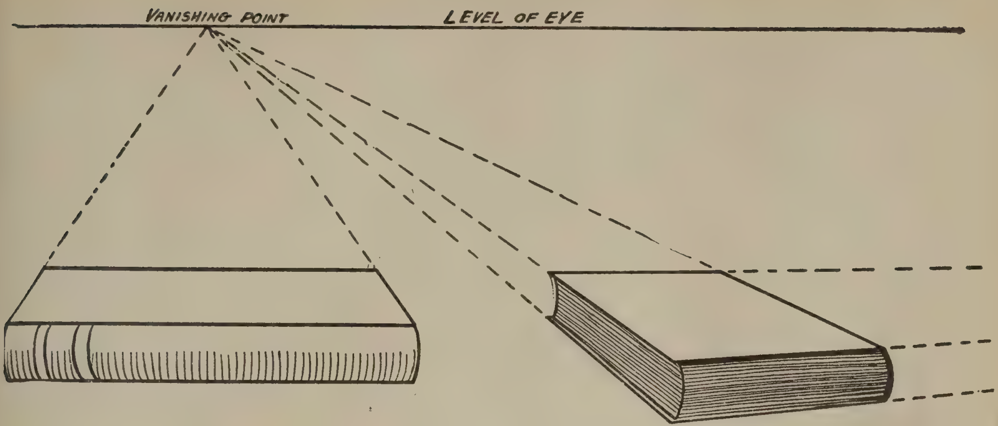


FIGURE 49

A book is a difficult object to draw correctly, and when the pupils have mastered this exercise they will be prepared to apply the principles to many common objects.

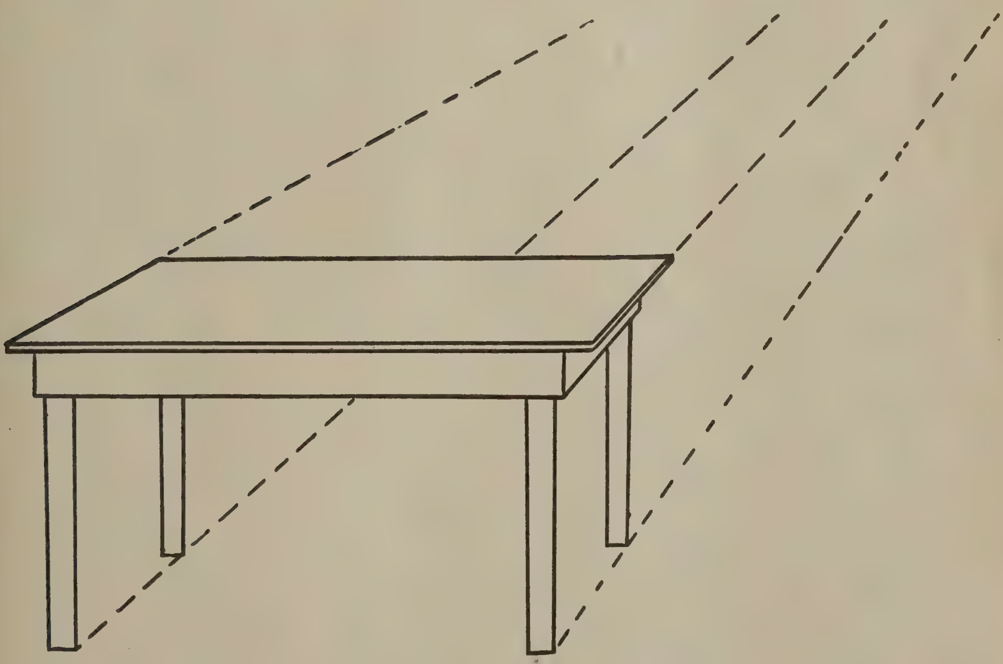
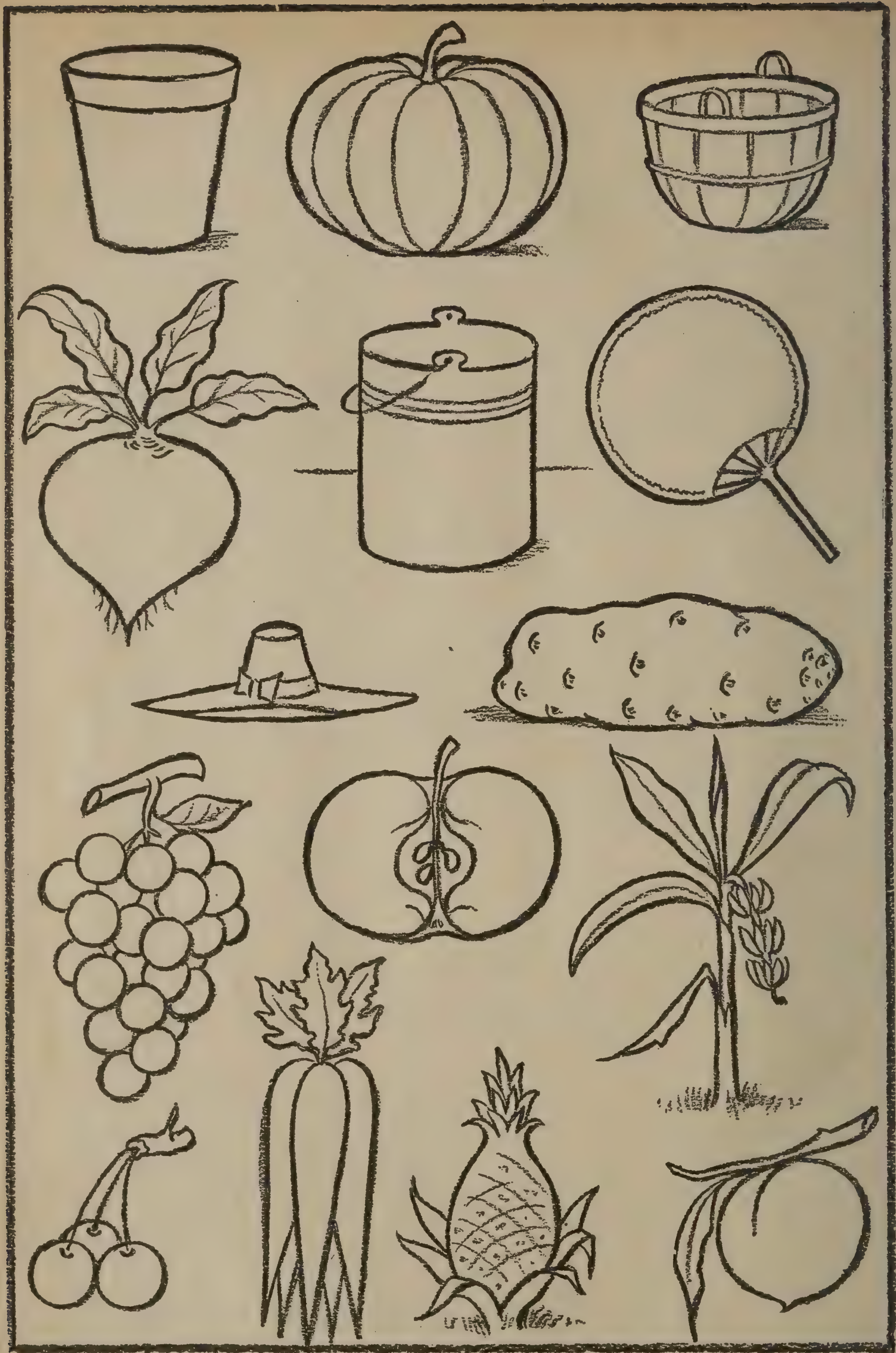


FIGURE 50

Here is a practical application of the principles of perspective. The table is suggestive of many other objects that can be used in a similar manner.



Studies for Outline Drawings

These studies can be reproduced in pencil or in ink. They are suggestive of many others that can easily be procured.

PICTURE MAKING

When several objects are arranged in a group they form a picture. Attention has already been called to grouping (page 3352), but we wish here to treat more fully of the arrangement of objects. Some amateur photographers are more successful than others in securing pleasing pictures because they make a careful study of the composition of the picture on the screen before exposing the film. Drawing a picture requires the same sort of study.

In picture drawing, finders (Figure 53) take the place of the camera screen. Finders can be made of a good grade of cardboard or of the common strawboard used in the manufacture of boxes. Care should be used to secure a right angle in the corner of each finder.

We here show several small pictures

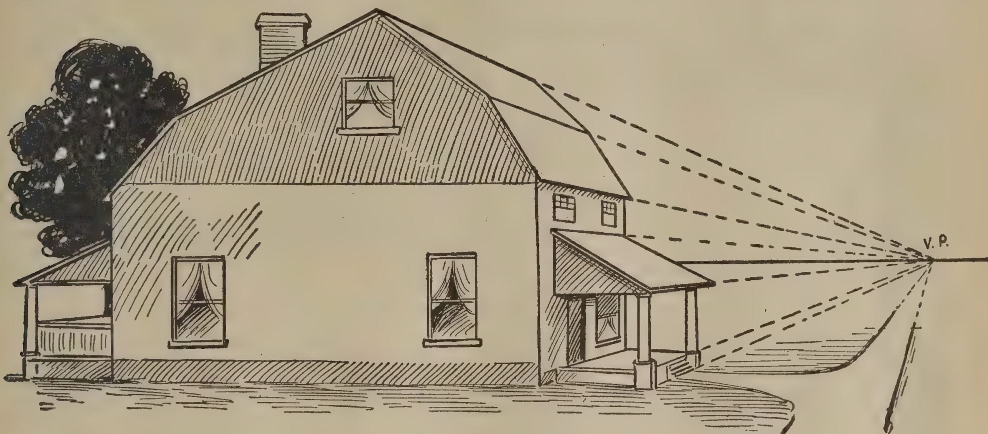


FIGURE 51

This sketch is illustrative of many out-of-door scenes which pupils should sketch. It is interesting to have each pupil make a drawing of his home and its surroundings.

FIGURE 52

Compare this sketch with Figure 38. What is the chief point of difference in the two pictures?

enclosed in finders. Children delight in small simple sketches of this sort, and will often use them for decorative purposes. Study carefully Figures 54-57 and note the possibilities they present.

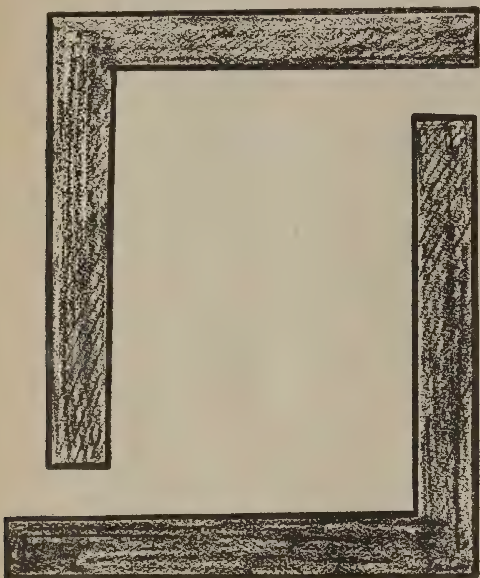


FIGURE 53

The exercises in which we have illustrated the use of the finders should be applied in illustrating written work in geography, history and other subjects.

FIGURE 54

This is really a "thumbnail" sketch, but it embodies all the elements of a landscape. When the finders are removed an initial can be worked into the picture if desired.

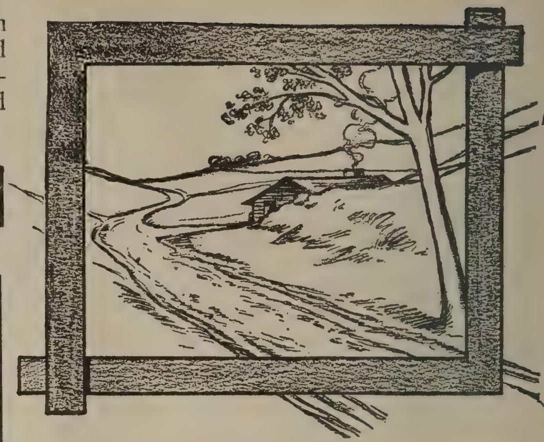


FIGURE 55

A simple country scene. Notice the position of each object in the picture. Would the picture be improved by moving the finders to the right? Why?

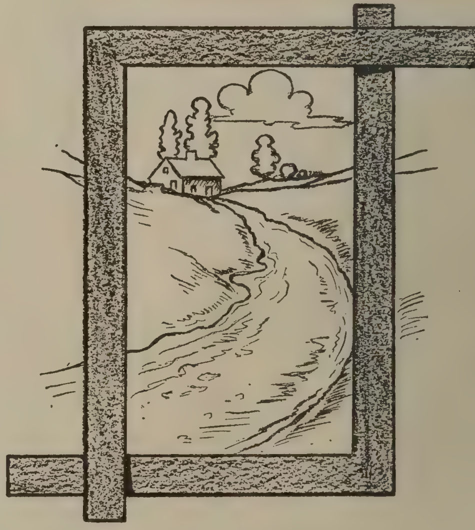


FIGURE 56

This sketch is in form of a panel. Several small pictures of this sort can often be effectively used to lend interest to a descriptive essay.

When the pupils have learned to make small sketches like these they can easily reproduce scenes on a large scale. This is excellent practice for training the hand, the eye and the artistic taste of the pupils.

SHADING

Many drawings are made more effective by shading.

1. Some objects, such as the crown of a tree, should be shaped wholly by shading, an outline rendering the appearance of the object harsh and unnatural (Figure 58).

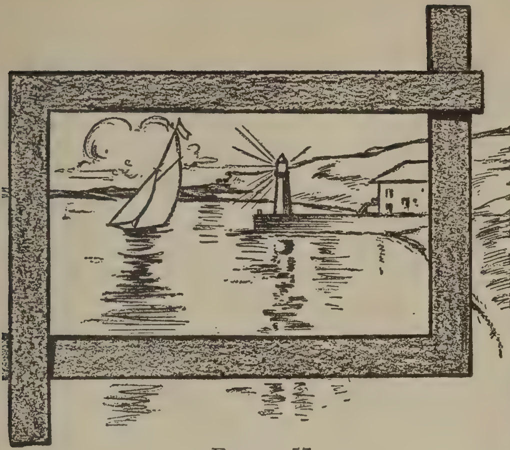


FIGURE 57

Here we have a water scene. Notice how a few simple strokes of the pencil can produce a pretty picture.

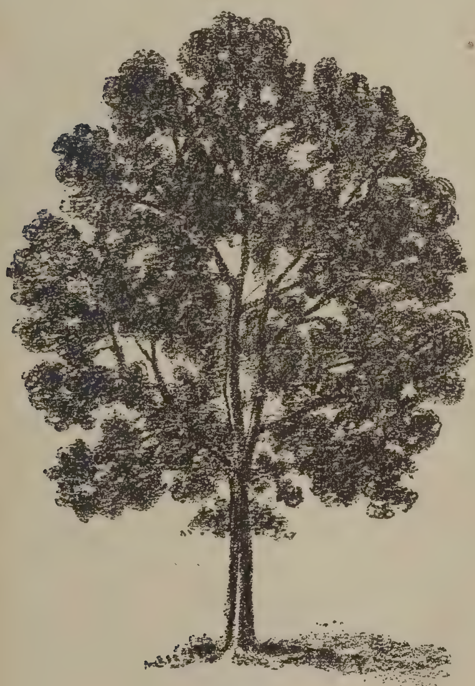


FIGURE 58

The perfection of this sketch will require repeated exercises. At first the tendency will be to make one side of the crown larger than the other. Practice, however, will enable the pupils to overcome this defect.

FIGURE 59

The cat-tail is always interesting. It can be reproduced equally well in ink, in color and in pencil.

In shading always notice carefully the direction from which the light comes. It is then easy to see what part of the object is in the shadow.

Observation and practice will soon enable one to handle light and shade effectively.

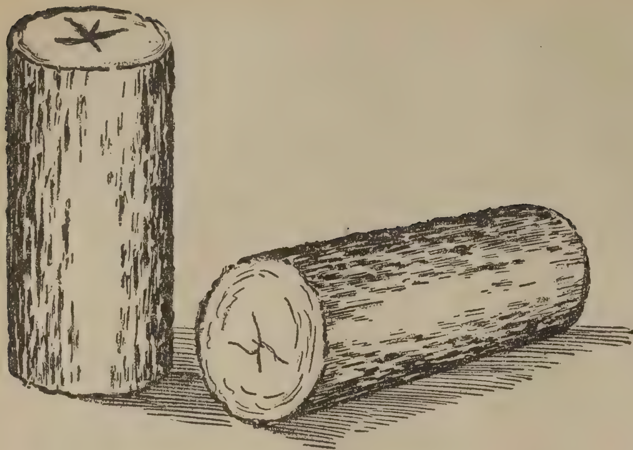


Figure 60

Before making this sketch review the principles of perspective as applied to the cylinder (Figures 45-48). Notice how the shading aids in bringing out the solid effect.

2. Proper shading emphasizes both form and relief (Figure 60).

3. Grasses are more perfectly represented when shaded (Figure 59).

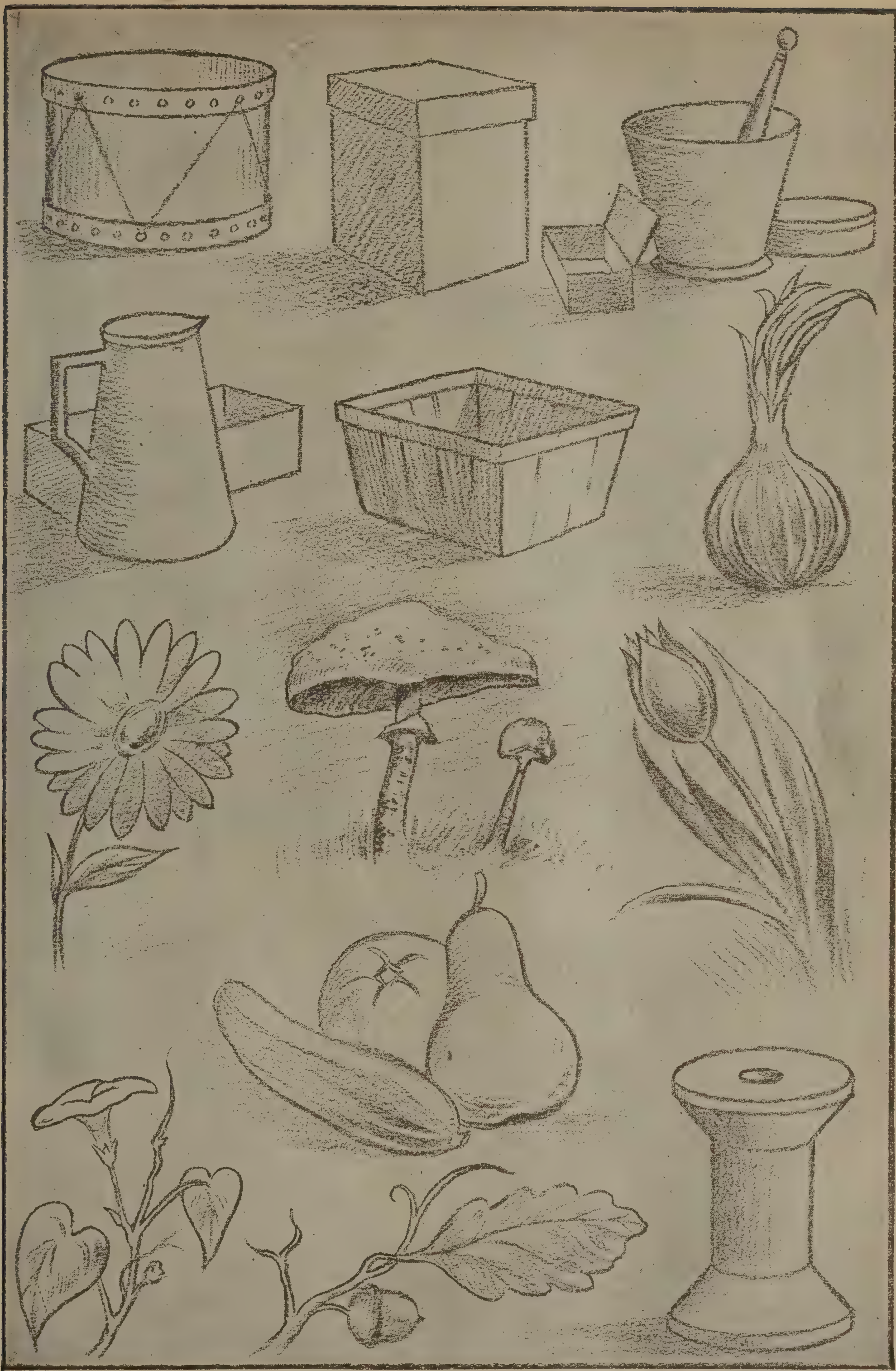
4. Shading is always necessary to make landscapes effective (Figure 61).

Study the shading in the objects on the next page and notice how it brings out the idea of solidity; also how it lends beauty to the drawing. Skill in shading enables the pupil to make beautiful pictures of the most common objects. Anyone can acquire this skill by practice.

Out-of-door sketching is an excellent exercise for this purpose. Select some simple scene, and see how attractive a drawing you can make of it. A landscape containing a body of water is to be preferred, because it gives greater variety to the picture and also adds an element of beauty.

Figure 61

Here is a winter scene. When the pupils can reproduce the sketch with a good degree of accuracy let them change it to a summer or autumn scene.



These objects form excellent studies; they also suggest the sort of objects which pupils should use for models in their drawing lessons.

SUGGESTED COURSE IN DRAWING

INTRODUCTION

The following course is suggestive of what may be undertaken in drawing in any public school. Apply the principles set forth and relate the drawing exercises to everyday life, and you will keep the pupils interested.

The material described on page 3344 is applicable to the work. Elaborate apparatus and expensive material are not necessary.

The drawing teacher does not expect each child to become an artist, but considers the drawing lesson a means by which the child may learn to express his own ideas, as in writing, speaking, etc. The drawing lesson is doubled in value, however, when used in correlation with other studies.

Art in the public schools is divided into special subjects which vary in the different grades. The main subjects are:

Color
Landscape
Animals
Figure posing
Still life
Fruit and vegetables
Flowers
Design
Construction work.

Mediums: Scissors, crayola, charcoal, water color, pencil.

Key

1. Nature work.
2. Object drawing.
3. Illustration.
4. Construction work.
5. Lettering.
6. Design.
7. Color.

GRADE ONE

1. Simple sprays—flowers—work for good placing and proportion.

2. Should know names of a square—rectangle—circle—and triangle.

3. Illustration of stories of grain.
Illustration of stories of animals.
Illustration of fall, winter and spring sports.

4. Learn paper tearing—folding and cutting.
One-inch measurements on ruler.
Weaving of paper mats.

5. Print single letters.
Work for form and spacing.

6. Arrangement of square, rectangle, triangle, circle, in border form.

7. Flat tones of primary colors—how to mix green—purple—and orange.

GRADE TWO

1. Nature work—tree masses—work for placing and character.

2. Silhouettes of common objects of interest to child—toys—work for form and proportion.

3. Illustration of experiences—observations.

4. Should be able to measure one-half inch on the ruler—paper tearing—cutting and folding.

5. Lettering of single words—names.

6. Design borders—from animal cuttings.

7. Should know names of the primary colors and their mixtures to form secondary colors.

GRADE THREE

1. Nature work—separate tree forms—work for good drawing, placing and color. Animal and bird forms.

2. Draw familiar objects—in silhouette and color—work for accurate drawing and color.

3. Illustration of poems and stories of the grade.

4. Should be able to measure one-quarter of an inch on ruler—paper cutting—cardboard pasting.

5. Print titles or full names—consider spacing of the different words—and forms of letters.

6. Design units for surface patterns—using flower or animal motifs.

7. Flat tones and graded tones of primaries—Review the secondaries by accidental coloring.

GRADE FOUR

1. Plants, trees, grasses, sprays—outline—mass and color.

Work for arrangement, growth and proportion.

Landscape—rivers and roads in proper perspective.

2. Silhouettes of cylindrical objects—watering can — pitcher — of interest to child—sled, skates, bat.

Vase form, showing top—half an apple. Should know—cube, sphere—semicircle and ellipse.

3. Illustration of past experiences—seasonable sports—work for tone, color, action, perspective and proportion—study of pictures for suggestion.

4. Problems of cardboard raffia.

Calendars—blotter pads—envelopes—portfolios and other gifts for Christmas.

5. Letter—sign—title page—plain upright Gothic letters.

6. Design borders — corners — book covers.

Consider appropriateness of unit—careful background spacing in relation to foreground or design proper.

Apply in construction work.

7. Graded washes—work for fresh colorings.

GRADE FIVE

1. Draw plants, sprays, flowers, birds—attention to foreshortening.

2. Drawing from still-life objects—vase forms and fruits—foreshortening of circular top—table line—flat tones.

3. Figure posing—mostly in silhouette.

4. Cardboard construction — checkerboard—large envelopes, etc.

5. Study of Gothic lettering—print alphabet—apply on book covers.

6. Cuttings of units from flower forms—borders with corners to turn—design square tile.

7. Study of color harmonies—wall paper—dress goods—rugs. Matching of color.

GRADE SIX

1. Draw sprays, flowers, plants—attention to foreshortening. Detail sketching—representation of turned leaves.

2. Drawing from still life—showing shaded side of object and table shadow. Foreshortening of circles—with corresponding shading.

3. Illustration used for calendars, etc., and for book covers.

4. Bookmaking and design.

Make post card albums—binders board cover—cloth hinge and paper sides and lining.

Designs appropriate for cover.

5. Simple upright letters—print a given word in several given spaces.

6. Landscape, fruit and flowers treated decoratively.

7. Matching of color for cultivation of color sense—apply on all construction work and drawings.

GRADE SEVEN

1. Draw sprays—flowers—trees, roads and houses in landscape.

2. Learn principles of perspective—apply in book drawing.

3. Illustrate material found in geography and English.

4. Bookbinding—sewed book with cloth cover—for recipes or notes.

5. Print mottoes—and titles.

6. Design units and all-over patterns for book covers or construction work at Christmas.

7. Exercises in the complementary colors—apply in design.

GRADE EIGHT

1. Flowers and landscape used decoratively—attention to seasons and time of day.

2. Principles of perspective—apply in interiors and the buildings of a city street.

3. Illustrate composition work.

4. Bookbinding—sewed book with cloth corners and binding.

5. Illuminate mottoes and compositions and titles with initial letters.

6. Design a circular mat—or plate—careful color application.

CONSTRUCTION WORK

Something to do, something to think about, something to enjoy in the woods, with view always to character-building, for manhood, not for scholarship, is the first aim of education. —*Birch-Bark Roll, 1904.*

Every normal boy and girl likes to work with the hands; any normal boy and girl possesses to a certain degree the power of invention. In the boy this is manifest in many attempts to construct tools, tents and sometimes intricate machinery or apparatus, such as that for wireless telegraphy.

In the girl the inventive tendency is seen in the creation of new styles of dress for dolls, the making of new decorative designs and attempts to improve upon established methods in the discharge of household duties.

In their opportunities to give free exercise to this inventive power, the boys and girls who live in the country have the advantage over their city cousins, for in the city almost everything is placed in the home or school ready for use.

This desire to know how things are made, to invent, gives rise to innumerable questions which teachers and parents often find troublesome, but which, nevertheless, should receive careful attention, and it is the purpose of the following pages to assist in answering some of these questions by giving simple directions for making articles which boys and girls enjoy.

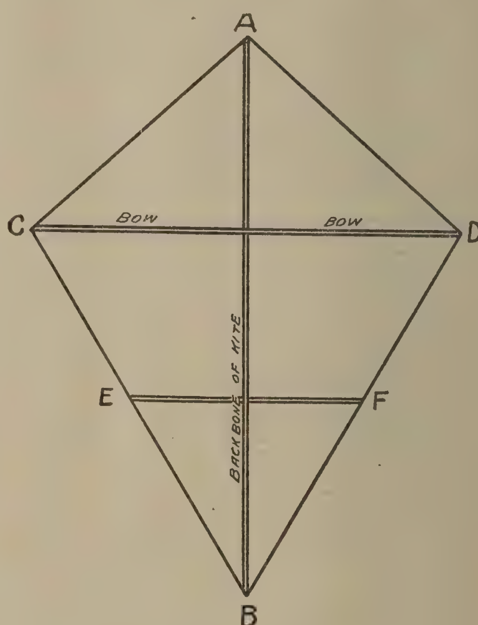
HOW TO MAKE KITES

Common Kites

Almost every boy twelve years of age has made a common kite.

The frame may have one or two cross-sticks, but two secure greater strength and durability. The diagram shows how these are put together and their relative lengths. The exact length of each depends upon the size of kite desired. The beginner will manage a small kite better than a large one. A good proportion of length to width is 7 to 5; that is, if AB is 21 inches long, CD should be 15 inches long; if AB is 42 inches long, CD should be 30 inches. This is a good size.

To determine the length of the second crosspiece, EF, cut notches in the ends of AB and CD, and draw a light strong cord tightly around the frame and tie it in position.



Common Kite

The bridle and girding cords should be attached at A, D, B and C. Attach the cord by a slip knot so that it can be easily slipped on the bridle until the kite balances well in the air.

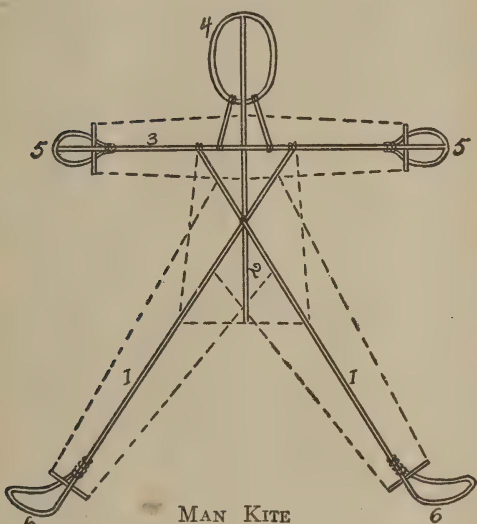
Cover with strong paper or a light cloth. Cut the cover large enough to allow one-half inch for folding over the frame and fastening.

Man Kite

The man kite, or boy kite, is interesting and is easily made.

Cut two light straight sticks, each 3 feet 9 inches long (1, 1). These are for the legs.

Cut a third stick 2 feet 6 inches long (2). This is for the spine. Cut a fourth, 3 feet 5 inches long (3). This is for the arms. With a piece of split bamboo or rattan make a hoop (4) 8 inches in diameter. This is for the head.



MAN KITE

Fasten this hoop to one end of the stick to be used for the spine by tying it firmly with strong light string. Be sure that this stick passes through the center of the circle.

Find the middle point of the arm stick and mark it. Measure 7 inches from this point to the right, and mark the distance on the stick. Measure 7 inches to the left and mark the point.

Now with a tack or a small brad, nail the arm stick at its middle point to the spine, placing it a few inches below the hoop.

In the same manner nail the leg sticks to the arm stick at the points marked. Be sure that the arm stick is at right angles to the spine.

Cross the leg sticks and spread them until the lower ends are at least three feet apart; then nail them to the spine.

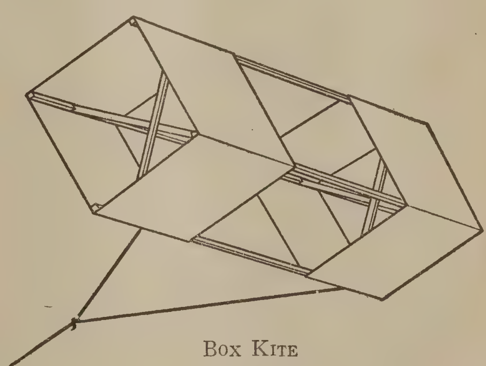
You now have the frame for the kite. This is completed by attaching small ovals to the ends of the arm (5, 5) and leg (6, 6) sticks, for hands and feet. These circles can be made of the same material as that for the head, or of light wire. Be careful to make the circles for the hands the same size; also those for the feet. Otherwise the kite will not balance.

Put on the string as indicated by the dotted lines, and cover with strong tissue paper. By using paper of different colors for pants and coat, a very striking figure can be made.

The bridle can be attached as in the common kite.

Box Kite

The box kite has strong lifting power, but it is more difficult to construct than those already described. Of course the larger the kite, the greater its lifting power, but one 42 inches long and a little over 18 inches wide is large enough to begin with.


BOX KITE

The frame for such a kite requires four sticks of light wood, such as white pine, basswood or spruce. The sticks should be ¼ inch square and 42 inches long.

For braces, use four pieces ½ by ¼ inch, and cut them 26 inches long. Nail these together in pairs, being sure that

the sticks cross each other at their middle points at exactly right angles. Cut a small notch in the ends of each brace so that they will fit on to the long sticks. It is well to make the braces a little longer than the measure given, so that they will fit tightly.

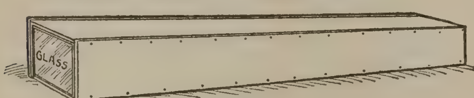
Cut two bands of cloth (light muslin or cambric is best) 74 inches long and 12 inches wide. Turn the ends of these bands under ¼ inch and hem them. Mark each band off into sections 18½ inches long. In each case make a pencil mark across the band at right angles to the margin.

Tack the bands along the pencil marks to the long pieces of wood so that the outer edge of each band will be even with the ends of the sticks. This will leave an open space 18 inches wide between the bands.

Put in the braces and attach the bridle as shown in the illustration. Tie the string with a slip knot so that it can be easily moved on the bridle to balance the kite. With practice a boy will become very skillful in the use of this kite.

HOW TO MAKE A WATER TELESCOPE

When you go to Catalina Island you can go out in a "glass-bottomed" boat and view the wonderful and beautiful objects that live in the sea. But you do not need to go to Catalina or even to the seashore to see many interesting objects that live in the water. A simple device which any ingenious boy can make will enable one to study the plants and animals that live in rivers and lakes.



Water Telescope

Construct a square box about 3 feet long and 8 or 10 inches in diameter. Before nailing the box together put a good coat of paint made of white or red lead on the edges of the boards, so as to make the joints water-tight.

Fit a piece of window glass of double thickness to one end of the box. Make the joints water-tight by using paint and putty. Put the box in water, glass-end down. Look into it and see what you can discover. If the joints leak tighten them with putty.

With this simple apparatus you should be able to see distinctly in clear water objects 30 feet below the surface.

HOW TO MAKE A PAPER BALLOON

For small balloons, such as are ordinarily used on the Fourth of July, tissue paper is the best material. For large ones manila should be used.

Decide upon the height of the balloon, then make the strips for the gores about one-third longer; that is, for a balloon 4 feet high the strips should be 6 feet long. A balloon of this size will require 13 gores, each coming to a point at the top, 4 inches wide at the bottom and a foot wide at the widest point.

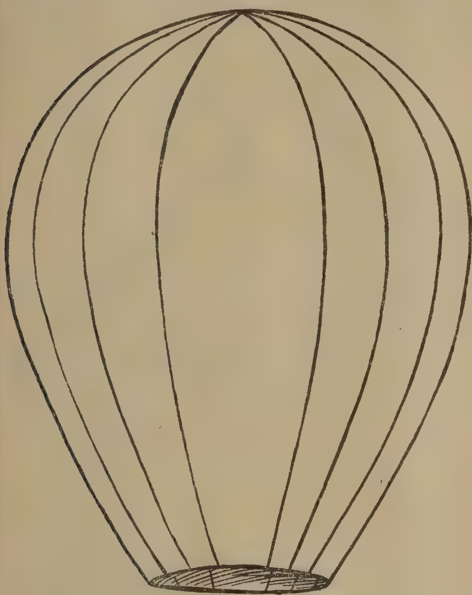
A Gore

To Make the Gores. Paste sheets of tissue paper to obtain strips of the required length. Second, make a pattern of strong manila paper. The strip should be 6 feet long and 1 foot wide, and should be a perfect rectangle. Fold the strip lengthwise through the middle. At one end of the strip measure 2 inches from the fold and mark the point; 1 foot above the bottom measure 3½ inches from the fold and mark the point; 2 feet from the bottom measure 5 inches; at 3 feet 4 inches measure off 6 inches; at 4 feet measure off 5 inches; at 5 feet measure off 3 inches; at the top nothing.

Connect these points by a curved line and cut the pattern along this line. If the work is carefully done you will have a gore 4 inches wide at the bottom, 1 foot wide at the widest place, and coming to the point at the top.

Cut the tissue gores by this pattern. Fold the gores as the pattern was folded for cutting.

Lay the first gore on the floor and place the second upon it so that the curved edges will meet. Let the lower gore project to the right about a quarter of an inch. With a brush cover this narrow margin with paste, then fold it over, and with a cloth or the hand press it down firmly on the second gore. Proceed in like manner until all the gores are pasted together. Then join the last two edges.



PAPER BALLOON

Make a hoop of rattan or light wire to fit the mouth of the balloon. Stretch two fine wires across the hoop so that they will cross each other at right angles in the center. Fasten the hoop in position by pasting the ends of the gores around it.

Hold the balloon so that the mouth will be against a light wind, or use a large fan and fill it with air. When filled, inspect it for leaks. If there is an opening at the top paste a piece of paper over it.

Procure some old-style lamp wick and wind it into a loose ball 2½ to 3 inches in diameter. Run a wire through the ball and attach some wire hooks to each end of this wire so that the ball can be quickly attached to the cross wires in the mouth of the balloon.

Saturate the ball with alcohol or kerosene.

Fill the balloon with air, hold it in an upright position, attach the ball and ignite it. Hold the balloon until it begins to rise; then let it go.

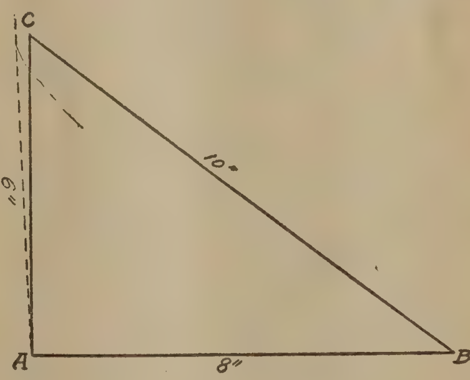
If the balloon can be filled with hot air before placing the ball in position it will ascend higher than otherwise.

Balloons should not be sent up when there is a wind because they are soon blown over and set on fire.

HOW TO MAKE A RIGHT ANGLE

One frequently wants to make a right angle when without a carpenter's square. Such an angle can be quickly and accurately made with a foot rule or any straight measure marked into inches.

To make the angle, measure a line 8 inches long (AB) and mark it. At one



A RIGHT ANGLE

end of this line measure a line 6 inches long (AC), running it as nearly perpendicular to the first as possible. Mark this line lightly. Place the measure on B and extend it to C, so that a triangle is formed with the measure making the third side. If the two lines are perpendicular B and C will be 10 inches apart. If the distance is more or less than 10 inches mark the 10-inch point on the surface upon which the lines are drawn and re-

construct the line AC, drawing it through this point. The angle formed is a right angle.

This is a practical application of the principle of the right triangle. The length of the hypothenuse (the side opposite the right angle) of a right triangle is equal to the square root of the sum of the squares of the other two sides.

$$6^2 = 36 \qquad 8^2 = 64$$
$$64 + 36 = 100$$
$$\sqrt{100} = 10$$

Low ground should be avoided because it is liable to be damp; it may also be infested with mosquitoes.

Setting Up the Tents

Tents are so easily procured that it is safe to assume that you are to have a tent for your shelter. The common wall tent shown in the illustration is the most satisfactory for general purposes. The A tent is simpler but less convenient. A wall tent 9 feet square will furnish accommodations for four people. The wall tent has a ridge pole and three standards.

A Wall Tent

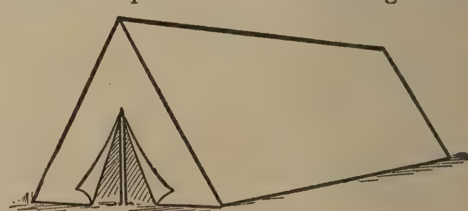
CAMP LIFE

Every boy and girl enjoys camping out for a few weeks in the summer. But the enjoyment is much greater if one knows how to camp. The lad living in the country where timber is plentiful learns more or less woodcraft in connection with his farm tasks, but the city lad enters a new world the first time he goes into the woods. Those without experience in camping will find the following suggestions helpful:

Selecting the Site

The camp should be located on a spot higher than the surrounding land, or on a slope, so that the site will be dry. A south slope under large trees is ideal, provided fuel and water are convenient.

The ridge pole should be placed under the canvas so that it comes exactly in the middle. The guy ropes should be attached to the upper end of each standard at the ends of this pole, and strong stakes be provided for securing these ropes. The standards and the canvas over them should be raised and held in position until the guy ropes are fast-



An A Tent

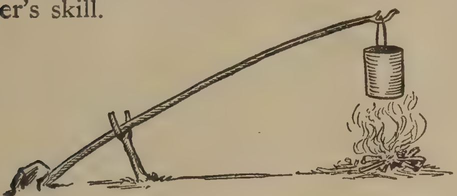
ened. Then the other ropes can be drawn taut and fastened, and the tent is up ready for use.

In adjusting the ropes care must be taken to bring the standards to a vertical position.

Dig a trench about 6 inches deep and 2 or 3 feet from the wall around the tent except in front. This will prevent the water from running under the canvas when it rains.

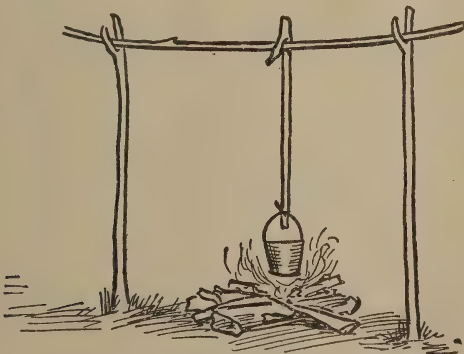
Making Camp Fires

Your fire is for good cheer, for comfort and for cooking. There are several ways of making a camp fire, and perhaps his ability to make the sort of fire he wants is the highest test of the camper's skill.



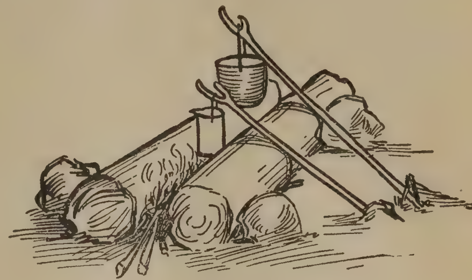
A Simple Pothanger

The fire should be planned for the purpose for which it is intended. There are three plans which may be used successfully for cooking. The simplest of these is the common pothanger shown in the illustration. With this arrangement a small fire is sufficient to boil the pot.



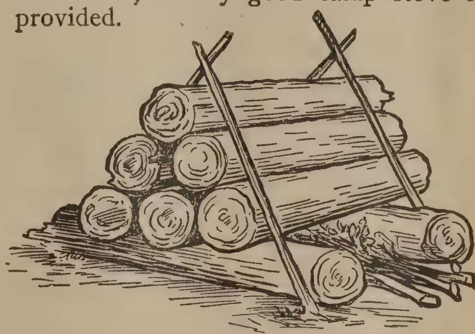
Pothanger with Two Standards

A more pretentious arrangement is that having two standards driven into the ground and supporting a horizontal pole upon which the pots are hung. This arrangement gives a firmer support than the former, and will admit of hanging two or more pots over the fire at once.



A Fire Between Two Logs

The third plan consists in placing two logs about six or eight inches apart, and making the fire between them. Common pothangers can be used in this plan as in the first. But this plan makes the best fire for roasting or frying. With a good bed of coals between the logs and a thin, flat stone or piece of sheet iron to lay over them, a very good camp stove is provided.



A Log Fire

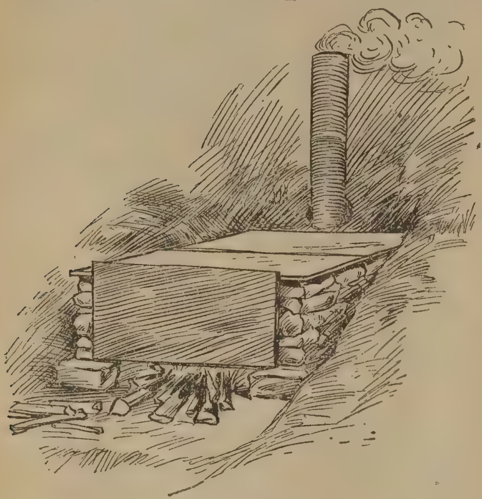
The fourth plan shows how to arrange logs for a fire that will last for several hours, possibly all night. Firewood should be placed between the logs lying on the ground, for the purpose of starting the fire.

THE CAMP STOVE

For a permanent camp something more durable than the fires described above is necessary. A very convenient and durable camp stove can be made on the following plan:

The material required consists of some stones which can be made into walls for

the sides of the stove, a large, thin stone or a piece of sheet iron for the top, a piece of sheet iron for the door, and two or three joints of old stove pipe for a chimney. If the camp is on a slope make



A Camp Stove

an excavation like the one shown in the illustration. Pack the walls with clay or other earth to make them practically air-tight. Set the stove pipe so that the air cannot leak in around the base, and the stove will have a good draft. Such a stove is durable, convenient and requires less fuel than an open fire.

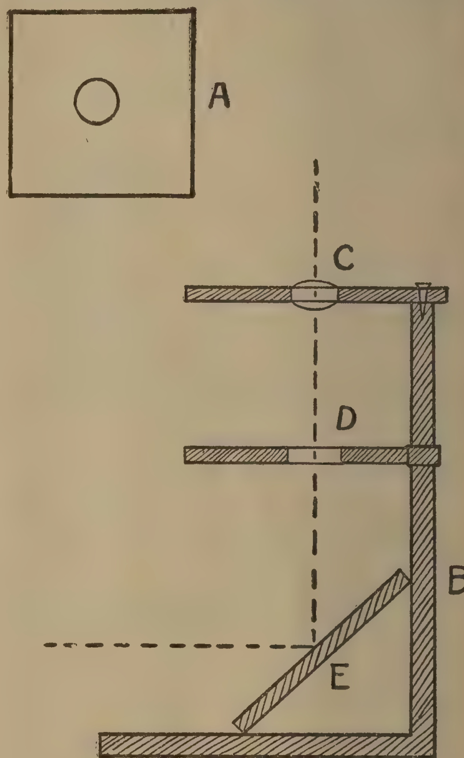
HOW TO MAKE A SIMPLE MICROSCOPE

This microscope can be made by an ingenious boy without expense. Take a thin piece of metal about 1/32 of an inch thick. Cut it about one inch square and drill a hole 1/16 of an inch in diameter through the center A.

Mount this on a stand about four inches high. Underneath the metal plate there should be a stage which can be raised or lowered for carrying the slide, and below this a small mirror, set so as to form an angle of forty-five degrees with the surface of the slide. The stand can be made in this form:

C represents the holder of the plate, D the slide carrier and E the mirror. The base and stand must be heavy enough to allow the stand to set firmly upon the table. The slide for holding the object should be made of a piece of thin glass and should be about ½ inch wide and 2½ inches long. The glass should be perfectly transparent and free from defects.

To provide a lens, dip a pointed stick into water and allow it to drip until a drop of water remains on the end. By touching the stick very carefully to the aperture in the metal plate, transfer the



A Water Microscope

drop of water to the opening in the plate. You will then have a lens that will magnify nearly 100 diameters. Place the object on the slide, hold the eye near the lens and quickly raise or lower the slide carrier until the magnified image becomes distinct. With this little mechanism the hairs on the edge of a fly's wing, the scales of a butterfly or moth, and other interesting objects can be seen.

STORY TELLING

COMPILED BY BERTHA M. WHITE | PICTURES BY CHARLES H. KETCHUM

What is the purpose of a Department of Story Telling?
Why should I learn to tell stories?
How does story telling help the boys and girls?
How does it help *me?*
When and how did story telling begin?

Have such questions as these not presented themselves to you, dear reader, at various times? You will find them answered, and others of equal interest, in the following pages. Best of all, farther on you will find a large number of stories all ready for the telling.

HOW STORY TELLING BEGAN

When we look for the beginnings of story telling we can readily understand why all the world loves a story. We come by this enjoyment honestly—it is our heritage from the past. Story telling began long, long ago. In studying its history we are given a series of varied and fascinating pictures—groups of American Indians sitting around the fire; Chinese and Japanese story tellers entertaining in the market place; the strolling troubadours of France; the scalds of Scandinavia recounting the deeds of mighty gods and kings.

Where did these ancient story tellers find the tales with which to entertain their hearers? To understand the origin of stories we must understand the conditions under which our primitive forefathers lived, for the stories that have come down to us from remote times are but human desires and beliefs expressed by an eager imagination.

EARLY INTERPRETATION OF NATURE

Our forefathers of an uncivilized age knew nothing of technical science. They did not know why the lightning brought destruction or why the thunder rolled in the heavens. They had not the least idea that the sun was the center of a system of planets, of which our earth was one. But they did have human emotions and desires, and the imaginative faculty by which they interpreted nature in the light of their personal experiences.

Was it not natural that, with their admiration for the fighter, and their love for the fight, they should think of the sun as a great warrior who battled with the storm-clouds? The clear sky after the storm was a token that the sun had conquered his enemies. Also they were keepers of the flocks, and so they thought there was an old shepherd King, Æolus, who guarded the winds at night, turning them loose in the morning to blow over the land and the sea. Sometimes, too, a battle with a wild beast would form the basis of a story, or the exploits of a hero of the tribe who went forth to battle and led his followers to victory.

In some such way as this the myth and the folk tale took form; repeated again and again, and handed down from one generation to another, many survived and in time were put into written form.

THE WANDERING MINSTRELS

Those ancient story tellers who became skilled reciters of tales journeyed through many lands, welcomed alike by court and common people. We have a charming picture of one of these strolling minstrels in a poem called *Kalevala,* a Finnish epic. This poem is a collection of folk tales, and all the boys and girls will enjoy reading it, for it has the same meter and rhythm as Longfellow's *Hiawatha.* The following lines tell of the ancient minstrel, Wainamoinen:

Wainamoinen, ancient minstrel,
Passed his years in full contentment,
On the meadows of Wainola,
On the plains of Kalevala,
Singing ever wondrous legends,
Songs of ancient wit and wisdom,
Chanting one day, then a second,
Singing in the dusk of evening,
Singing till the dawn of morning,
Now the tales of oldtime heroes,
Tales of ages long forgotten,
Now the legends of creation,
Once familiar to the children,
By our children sung no longer,
Sung in part by many heroes.
Far and wide the story traveled,
Far away men spread the knowledge
Of the chanting of the hero,
Of the song of Wainamoinen.

STORY TELLING TODAY

Story telling suffered an ebb after the high tide of the troubadour period, and, though it never died out, 20 years ago a noted educator declared that it was a lost art. This statement is no longer true. An examination of the present story-telling situation shows that this pleasing art has now a very wide vogue. Educators recognize and emphasize its instructional value, but it has no less important a place in the daily life of the individual, and a close connection with his common interests and activities.

STORY TELLING IN THE SCHOOL

The use of story telling in the school is so admirably and so fully treated by Professor Patzer in the section *Language* of this volume (page 3256) that it seems unnecessary to discuss it here from a pedagogical standpoint. In the following pages, therefore, story telling is taken up as a subject of interest to everyone, with special emphasis placed on the story in the home.

STORY TELLING AS A FORM OF ENTERTAINMENT

As we said before, all the world loves a story. Story telling is a delightful pastime; it is associated with pleasant groups around the fireside; it has often made a rainy day an occasion for enjoyment indoors. The ability to tell a story well has saved the day for many a toastmaster or after-dinner speaker, and it is

a valuable aid to the orator and the clergyman. Story telling, then, regarded as a form of entertainment, is one of the world's amusements that should be cultivated because it serves to make life brighter and happier. Incidental to its pleasure-giving aspect, it is a means of imparting valuable information and of extending our knowledge of literature.

STORY TELLING AND THE CHILDREN

A Means of Bringing Joy to Children

That children love to have stories told them can be denied by no one who has had any care of boys and girls, or who has a memory reaching back to childhood. Those who value the happiness of children and have a true sense of its importance should rejoice that in story telling they have a wholesome means of gratifying their pleasure-loving instincts.

That joy has a beneficial part in the economy of life is a belief that has grown out of the great liberalizing tendencies of the modern period. The purpose of joy is to enrich the child's spiritual experience and to quicken his perceptions, and he needs joy just as the plant needs air and sunshine. Thus the primary aim in telling stories to children is to increase their joy in life.

A young woman who achieved success as a teacher and writer says that one of the most tender recollections of her childhood is the children's hour that her mother established in their home for herself and her two brothers. The hour just after the evening meal, from seven to eight, this wise mother held sacred for the three little ones, to be given over to story telling and reading. Now, after many years, this story hour is an experience to be recalled with unceasing pleasure, and who can estimate what its influence has been?

Let none of you mothers reading this think yourselves too busy to give some of your time to story telling. The innocent pleasure your children derive from hearing stories is one of your best aids in the training of your boys and girls.

An Aid in Moral Training

The moral training of the boys and girls is a most serious problem. How shall I teach my children to love good and to hate evil? is a question that all conscientious mothers ask themselves again and again. Such mothers should welcome story telling as a happy means of bringing before the children those virtues and principles that make for right living and noble characters.

It is not enough to urge the child to be brave and pure and honest; there must be some appeal to the emotions and the imagination before the child will respond. If, for instance, he sees the virtues—bravery and purity and honesty—embodied in the characters of a story to which he is listening with enthusiastic interest, he will be almost certain to make a personal application. Children as a rule transfer the experiences of the hero and heroine of a story to themselves; they live the story in imagination and thus they *feel* the impulse to be themselves brave and pure and honest. Such heroic characters in literature as Evangeline, King Arthur or Sir Galahad are an inspiration to any child who has become familiar with their stories.

Story telling thus has boundless possibilities in moral training, for by its use the mother may make those qualities which she longs to see her children cultivate, beautiful and attractive.

An Aid in Cultivating the Imagination

We have shown that story telling may be used to make the child happier and better, and it may occur to the thoughtful parent to ask if it has any part in his mental development. This question may be answered in the affirmative; stories are admirable for arousing and exercising the imagination, which, according to the psychologist, is one of the highest functions of the individual. The imagination has a wider and more useful function in life than is sometimes realized, for it is through this "ability to form pictures of objects of thought" that we bring things to pass. Through

the picture-making function of the mind the sculptor brings to perfection his image in marble, the architect his great cathedral, the inventor his labor-saving machine, and the child his ideals of character. The child who is not trained to form correct, clear and vivid pictures is going to be handicapped in *whatever line of work he may pursue.* The imaginative faculty enters into every act of life. Give your children material for mental pictures, mothers, and help them win in life's battles.

THE CHILDREN'S HOUR

An Aid in Developing the Emotions

Stories that make an appeal to the child's emotions are valuable in that they cultivate the feelings. Some years ago that child who was trained in the three R's was considered well equipped educationally; today we are emphasizing the three H's—the Head, the Hand and the Heart. If by stories we can help develop in our children the capacity to *feel,* we are going to make them better neighbors and better citizens. Such social workers as Jacob Riis and Jane Addams not only recognized intellectually the sufferings of humanity, but they felt them so keenly that they devoted their lives to bettering conditions. The indifferent citizen is the one whose head dominates his heart, who knows but does not feel his city's or his neighbor's need, and is therefore not stirred to action. Story telling should be used as a weapon in arousing and directing the child's feelings, both for his own sake and that of the community.

The Appreciation of Literature

The relation of story telling to literature is self-evident, for the story teller must go to literature for materials with which to work. In this lies one of the best opportunities for the mothers to help their children acquire a taste for good literature. If the little ones are fed on the right kind of stories they will have no taste for vicious and trashy books when they come to do independent reading. Thus the mother has it in her power to awaken and direct the child's appreciation for the beautiful in literature.

Adding to the Child's Knowledge

A story, even that which is intended only to give pleasure, will add to the child's fund of knowledge. By means of stories the child in imagination travels to other countries and becomes acquainted with boys and girls of other races. His outlook on life is broadened and his mental pictures multiplied. Nature stories, and biographical, geographical and historical tales are admirable to use when it is desired to impart information in a delightful way, but every story has its useful side.

Good Language Habits

The thoughtful mother wishes her children to acquire the habit of speaking correctly and in a refined manner. During the story-telling hour such a mother by her wise choice of language may sow the seeds of correct speaking. Many mothers are annoyed and grieved by the vulgar slang that they hear on the lips of their children, but children who have not acquired the good-language habit are very liable to imitate the coarse speech they hear outside the home. Use the story hour, mothers, to suggest correct and refined forms of speech to the boys and girls.

Story Telling and Story Reading

Those who are not practiced in story telling may ask if story reading will do as well. Story telling has certain advantages that are peculiar to it.

The story reader is hampered in giving expression to his story by the fact that he has to hold a book, and to keep his eyes, at least part of the time, on the printed page. The story teller, unfettered, may, with voice, facial expression and gesture, give himself completely over to his task. He may modify the story to suit the occasion and his hearers; in brief, he has more freedom than the story reader. This fact has special significance for the mother. The intimacy of the story hour, when the children are looking into mother's eyes, all eagerness and attention, must certainly strengthen those bonds that in after years will influence the child for good.

"Let me beg of you, mothers," says a woman who is much experienced in story telling, "do not think you cannot tell stories. Try; try; keep on trying; and ease in telling is bound to come. Do not think of yourself in the telling; think of the story and of the child who listens. Nothing else matters."

THE ESSENTIALS OF A GOOD STORY

Perhaps the mother who has been reading thus far is undecided as to what rules to follow in selecting stories. Allowing for the special problems with which each mother is confronted, we may say that the story adapted for telling has certain qualities that differentiate it from those not so adapted.

The Story's Beginning

The good "telling" story must begin in an interesting way, and the first few lines must give some clue as to its time, place and central figure. "Once upon a time there was a King in Spain who had only one leg," begins the mother, or "Under the window of a certain pretty cottage there grew a great old apple tree;" immediately the children are all eyes and ears, eager for the adventures of the one-legged King or the old apple tree. A piquant and suggestive beginning gives the story a certain momentum, besides arousing the expectations of the listeners.

The Story's Movement

The story, effectively introduced, should move forward to a well-defined climax. There should be plenty of narration or conversation or both, but little explanation. The incidents of the story should follow each other in such a way that they explain themselves. Life, action, dramatic interest should take the place of explanation.

Description may be introduced, but this should be essential to the story, be vivid, and not prolonged. In one of the King Arthur stories, as told by Richard A. Wyche, we have this description: "The hilt of the sword was in the shape of a cross, studded with jewels that sparkled and flashed. He pulled it from the scabbard and the blade was so bright that it hurt his eye to look at it." Such a bit of description is an essential part of the story, not an adornment, and it intensifies the interest in the tale.

Repetition

Repetition is a device that appeals especially to little children, but even the older children are allured by it. Certainly one of the chief charms of our classic *Silver-Locks and the Three Bears* is the repetition of the gruff complaint of the Great Huge Bear, the middle-sized complaint of the Middle Bear, and the tiny wail of the Little Wee Bear, which the children always await with gleeful anticipation. Repetition of the cumulative kind, as in *The Old Woman and her Pig* and *The House That Jack Built,* is also a delight to the children. It amounts almost to a game with them to hold in mind the "maiden all forlorn" and the "cow with crumpled horn," and the other objects that enter into the story of the house built by Jack.

The Point of Contact

As to the subject matter of the story, it must have something in common with the life and experience of the children. That is, it must have a *point of contact.* With some common ground from which to start, the story may lead on into the realms of imagination and into far-distant lands and remote times. We have only to recall our most popular fairy tales to realize the truth of this statement.

The Worth of the Story

Of still greater importance is the intrinsic worth of the story. We have indicated the possibilities in child training afforded by story telling, but it must not be forgotten that the good to be gained is dependent upon the character of the story. Julia D. Cowles suggests that the story teller apply these tests in measuring the "worth-whileness" of a story:

"Is the effect of the story helpful? Does it strengthen the imagination? Does it teach a right principle of action? Does it inspire a love for the beautiful and the true? Does it inspire reverence for the Creator and appreciation of the works of His hand? Does it exemplify sane and happy living? Does it teach neighborly kindness? Will its telling make a child better and happier? If the story calls for an affirmative answer to any of these questions, if, in other words, its teaching is simple, pure and true, then it is by all means worthy of telling."

HOW TO TELL A STORY

Know Your Story

"Do I need special preparation for telling my children stories?" asks the busy mother, who perhaps is experiencing difficulty in finding time even for the story hour. You need just as much preparation, mothers, as is necessary to make the stories you tell your personal possession. A story is not merely a number of words joined together; it is a work of art, a message, and the mission of the story teller is to transmit this message to others.

No one can give unless he first possesses, or interpret unless he understands. Therefore to know your story is the first essential in telling it. This does not mean word for word memorizing, but thorough assimilation of the substance and spirit of the story. Read and study your story until you have mentally formulated its plan, know its climax and the essential events leading to this cli-

max. Assimilation of its style should accompany the mastery of its subject matter, for the well-written story always has a literary style that harmonizes with its theme.

While literal memorizing is not advisable, any happy phrases, apt expressions or vividly worded bits of detail should be memorized. Sometimes the effect of a story is spoiled by the omission of certain picturesque phrases and vivid bits of detail. Those qualities that give peculiar merit to the story should be transmitted in the telling.

Know your story is the first rule for the story teller, whether the audience be the children at the mother's knee, the waifs in a social settlement, or the class in school.

Forget Self

If you truly know your story you will have little difficulty in following the other rules for the story teller. The first of these is to forget self. Become so interested in your story that you can think only of it and the children listening.

Be Direct

Secondly, be direct. A story in the telling is something like an acted drama moving with vim to a "snappy" ending. Therefore talking around the story, moralizing, introducing irrelevant details, must be excluded from your program. As someone has said, "Don't put up a five-barred gate in the path of the eager mind traveling to a climax." To tell the story directly is to use brevity and close logical sequence, and to exclude foreign matter.

Be Wholehearted

Tell the story dramatically, but with naturalness and simplicity. Throw yourself into the telling with wholeheartedness and animation; by means of voice, expression and gesture arouse the imagination of your listeners so that they will picture the story for themselves. To do this you must *see* what you *say;* this vizualizing power in turn depends upon the basic rule in story telling, to know the story.

Enjoy Story Telling

After all, mothers, and big sisters, and aunts, and anyone else who cares enough for the children to devote some time to story telling—after all, your success is going to depend upon the interest you yourself take in this beautiful art. Count it a privilege to learn story telling, and enjoy your work to the fullest extent.

All the pretty things put by
Wait upon the children's eye—
Sheep and shepherds, trees and crooks,
In the picture story-books.

We may see how all things are—
Seas and cities, near and far,
And the flying fairies' looks—
In the picture story-books.

—*Stevenson.*

RHYMES AND STORIES FOR LITTLE CHILDREN

The stories and rhymes in our first division are especially adapted to very little children. Nursery rhymes, with their simplicity, humor and appeal to the imagination, are excellent food for the little minds. Moreover, a child too young to follow the thread of a story can enjoy the musical cadence of a nursery rhyme. The dancing rhythm will please and satisfy his senses even before he knows what the words mean. Besides the Mother Goose melodies, the mother will find the child verses of Stevenson or Eugene Field admirably adapted to the purpose mentioned above.

In our selection of stories for the little ones we have borne in mind their delight in the antics and habits of animals.

UNDER THE HAYSTACK FAST ASLEEP

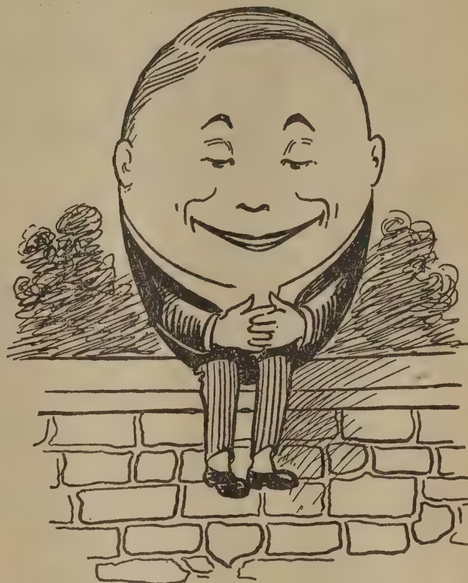
Little Boy Blue, come, blow your horn;
The sheep's in the meadow, the cow's in the corn.
"Where's the little boy that looks after the sheep?"
"He's under the haystack, fast asleep."

Little Bo-Peep has lost her sheep,
And can't tell where to find them;
Leave them alone, and they'll come home,
Wagging their tails behind them.

Bo-Peep Cannot Find Her Sheep

Humpty Dumpty sat on a wall;
Humpty Dumpty had a great fall;
And all the King's horses and all the King's men
Can't put Humpty Dumpty together again.

The Adventures of Humpty Dumpty



On the Wall

After His Fall

THE LITTLE DOG LAUGHED TO SEE THE SPORT

Hey, diddle, diddle,
The cat and the fiddle,
The cow jumped over the moon;
The little dog laughed
To see the sport,
While the dish ran away with the spoon.

"Pussy-cat, pussy-cat, where have you been?"
"I've been up to London to look at the Queen."
"Pussy-cat, pussy-cat, what did you there?"
"I frightened a little mouse under the chair."

THE APPLE PIE

A was an apple pie;
B bit it;
C cut it;
D dealt it;
E ate it;
F fought for it;
G got it;
H had it;
I inclosed it;
J joined it;
K kept it;
L longed for it;
M mourned for it;
N nodded at it;
O opened it;
P peeped in it;
Q quartered it;
R ran for it;
S stole it;
T took it;
U used it;
V viewed it;
W wanted it;
X, Y, Z, and amper-sand
All hoped for a piece in hand.

AN UNEXPECTED VISITOR

Little Miss Muffet
Sat on a tuffet
Eating her curds and whey;
Along came a spider,
And sat down beside her,
And frightened Miss Muffet away.

Jack and Jill went
up the hill
To fetch a pail
of water;
Jack fell down and
broke his
crown,
And Jill came
tumbling af-
ter.

THE MISHAP OF JACK AND JILL

Ding, dong, bell, Pussy's in the well!
Who put her in? Little Tommy Linn.
Who pulled her out? Big John Stout.

There was an old woman who lived in a shoe;
She had so many children she didn't know what to do;
She gave them some broth without any bread;
She whipped them all soundly and put them to bed.

Sing a song of sixpence,
A pocket full of rye,
Four and twenty blackbirds
Baked in a pie.

When the Pie Was Opened

When the pie was opened,
The birds began to sing;
Wasn't that a dainty dish
To set before the King?

Down Came a Blackbird

The King was in the parlor
Counting out his money;
The Queen was in the kitchen,
Eating bread and honey;

The maid was in the garden,
Hanging out the clothes;
Down came a blackbird,
And nipped off her nose.

MOTHER HUBBARD FINDS THE CUPBOARD EMPTY

Old Mother Hubbard
Went to the cupboard
To get her poor dog a bone;
But when she got there
The cupboard was bare,
And so the poor dog had none.

She went to the baker's
To buy him some bread,
But when she came back
The poor dog was dead.

She went to the joiner's
To buy him a coffin,
But when she came back
The poor dog was laughing.

She went to the butcher's
To get him some tripe,
But when she came back
He was smoking his pipe.

HE WAS READING THE NEWS

She went to the barber's
To buy him a wig,
But when she came back
He was dancing a jig.

She went to the tailor's
To buy him a coat,
But when she came back
He was riding a goat.

She went to the cobbler's
To buy him some shoes,
But when she came back
He was reading the news.

She went to the seamstress
To buy him some linen,
But when she came back
The dog was a-spinning.

She went to the hosier's
To buy him some hose,
But when she came back
He was dressed in his clothes.

The dame made a curtsey,
The dog made a bow;
The dame said, "Your servant."
The dog said, "Bow, wow."

SIMPLE SIMON BARGAINS WITH A PIEMAN

Simple Simon met a pieman,
  Going to the fair;
Says Simple Simon to the pieman,
  "Let me taste your ware."

Says the pieman to Simple Simon,
  "Show me first your penny."
Says Simple Simon to the pieman,
  "Indeed I have not any."

Simple Simon Tries to Get Water in a Sieve

Simple Simon went a-fishing
For to catch a whale;
All the water he could find
Was in his mother's pail!

Simple Simon went to look
If plums grew on a thistle;
He pricked his fingers very much,
Which made poor Simon whistle.

He went to catch a dicky bird,
And thought he could not fail,
Because he had a little salt,
To put upon its tail.

He went for water with a sieve,
But soon it all ran through;
And now poor Simple Simon
Bids you all adieu.

"I Would Call to the Stars to Keep Out of the Way!"

THE NEW MOON

Dear mother, how pretty
The moon looks to-night!
She was never so cunning before;
Her two little horns
Are so sharp and so bright,
I hope she'll not grow any more.

If I were up there,
With you and my friends,
I'd rock in it, nicely you'd see;
I'd sit in the middle
And hold by both ends;
Oh, what a bright cradle 'twould be.

I would call to the stars
To keep out of the way,
Lest we should rock over their toes;
And then I would rock
Till the dawn of the day,
And see where the pretty moon goes.

And there we would stay
In the beautiful skies;
And through the bright clouds we would roam.
We would see the sun set,
And see the sun rise,
And on the next rainbow come home.

—*Mrs. Follen.* (*Silver, Burdette & Co.*)

WHITE-PAW STARTS TO SEE THE WORLD*

White-Paw was a young mouse that lived with his mother. Their home was in a barn, behind some sacks of corn, and a very nice home it was.

When a sunbeam flashed in upon them at midday, "That was the sun," said Mrs. Mouse. When a ray of the moon stole quietly in, "That is the moon," said the simple-minded creature, and thought she was very wise to know so much.

But little White-Paw was not so contented as his mother. As he frisked and played in his one ray of sunshine or one gleam of moonlight, he had queer little fancies.

One morning, while at breakfast on some kernels of corn and sweet apples which his mother had brought home, he asked:

"Mother, what is the world?"

"A great, terrible place!" was the answer, and Mrs. Mouse looked very grave indeed.

"How do you know, mother? Have you ever been there?" asked the youngster.

"No, child; but your father was lost in the great world, my son," and Mrs. Mouses's voice had a little shake in it.

"Ah!" said the son, "that was for want of knowing better."

"Knowing better! Why, he was the wisest mouse alive!" said the faithful Mrs. Mouse.

"I could not have been alive then," thought White-Paw to himself. Then he said aloud, "Mother, I have made up my mind to go and see the world; so good-by!"

His mother wept. She tried to have him stay at home and be content—but all in vain; so she gave him a great hug, and he was off.

WHAT THE MICE SAW IN THE FARMYARD

He had not gone many steps when he met Mr. Garfer Graybeard, a wise old mouse, and a great friend to the family.

"Well, where are you off to, Mr. Pertnose?" he asked, as the young traveler was whisking by. "I'm off to see the world," was the answer.

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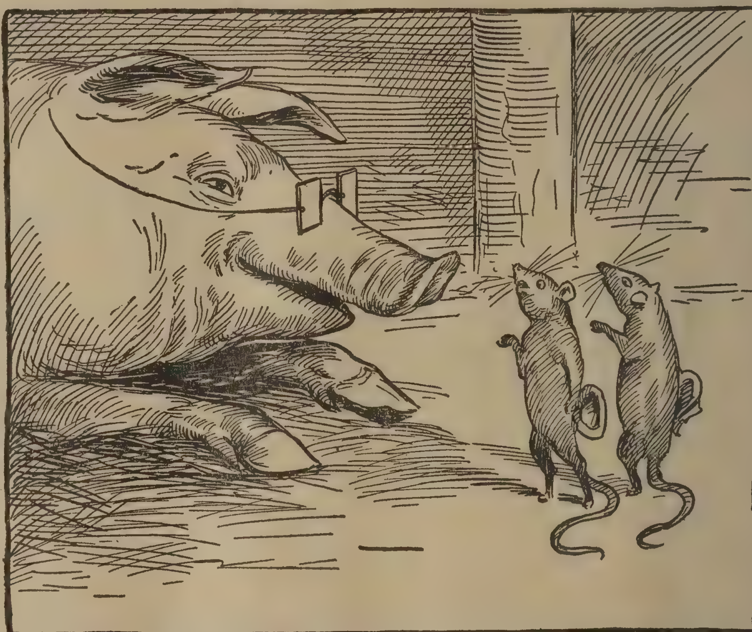
"Then good-by, for I never expect to see you again; but take an old mouse's advice, and beware of mouse-traps." "What are mouse-traps?" asked White-Paw. "You will know when you see them," was the answer.

White-Paw went on his way, and just outside he met another young mouse who had also started to see the world, and the two went on together.

"Oh, how big the world is!" said White-Paw, as they went into the farm-yard, and began to look about them.

"And what queer creatures live in the world!" said the other, as the cocks crowed, the hens clucked, the chickens peeped, the cow lowed, the sheep bleated, the pigs grunted, and the old house-dog barked.



THE PIG LOOKED AT THEM THROUGH HIS SPECS

"If we are to find out about the world, we must ask questions," said White-Paw.

So the two friends went about, stopping every now and then to admire or wonder at the new things they saw every moment.

Soon they came across a friendly-looking pig. "Please, sir," asked the wee simple things, "are you a mouse?"

The pig looked down to them through his "specs" as he heard the question in the tiny little squeaking voice, and he grunted a little as he replied:

"Yes, if you like to call me so," and the two friends went on.

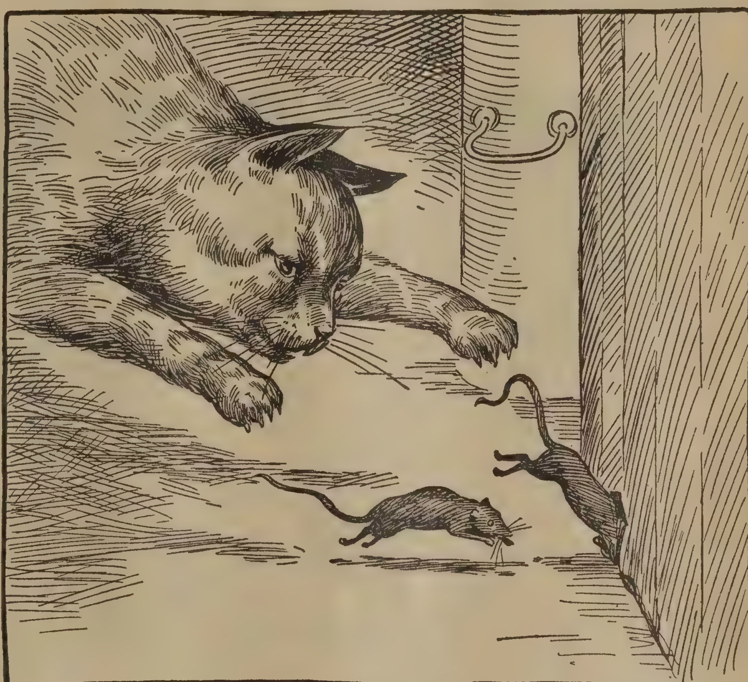
In a little while they came up where the old cow was feeding; and White-Paw, taking off his hat, said, "Please, are you a mouse?"

The old cow was too busy to answer such questions, but she shook her head in such a way that the travelers were glad to get off safe.

"There are great friendly mice, and great unfriendly mice, in the world," said White-Paw, as they went on their way.

Next they met a motherly old hen, who was busy in scratching up food for her chickens; and White-Paw asked, "Please, ma'am, are you a mouse?" "We don't mind what folks call us," said the old hen, giving them a friendly wink.

As they went on they learned a great many things about the world; but as yet White-Paw had not heard one word about a mouse-trap.



White-Paw Escaped Through a Hole Into the Pantry

Having gone around the farm-yard, White-Paw and his friend went through the gate toward the house. Here they met the dog, and asked the same question that they had asked before.

But the dog barked and snapped so that they could not make him hear, and they ran away in terror.

WHAT WHITE-PAW SAW IN THE KITCHEN

In their haste the two friends bolted into the kitchen of the farm-house, where an old tabby-cat lay dozing before the fire. But when they came in she arose to meet them.

"What a polite fat mouse!" thought White-Paw. "Please, ma'am—" But pussy's eyes were fixed upon him with a horrid glare, and he could not go on.

Alas! his poor little friend! There was a cry and a crunching of bones, and White-Paw just escaped through a hole into the pantry.

When he had in part got over his fright, he smelled toasted cheese—something he had heard of but never tasted. He sniffed about, and soon saw it in a little round hole.

By this time he was very hungry, and he reached out for the dainty morsel; but there was a sudden click, and he turned back—but too late! His tail and and one of his legs were caught by the cruel teeth of a trap.

The Two Hopped Off Together

He pulled with all his might, but could not get away. He heard a little squeak, and an old mouse came limping up with only three legs.

"Pull hard, my son; better lose a leg and tail than your life. See! I was caught like you. How came you here?" he asked.

"I came to see the world, and 'tis a terrible place!" As White-Paw spoke, he pulled himself free, but left one paw and the point of his tail in the trap.

The two hopped off together, and, after some friendly advice from the old mouse, White-Paw limped away to his home, and soon found himself by his mother's side, where he could have his wounds dressed, and rest in peace.

"My dear son, what is the world like?" asked Mrs. Mouse, after she had hugged White-Paw, and set his supper before him.

"Oh, it's a grand place! There are great black mice, and great white ones, and great spotted ones, and great friendly mice with long noses, and great uncivil mice with horns.

"Then there are queer mice with only two legs, and some terrible mice that make a great noise." At this moment Gaffer Graybeard came in, and White-Paw said, "Sir, I've learned what a mouse-trap is." "Ah, then," said the sage, "you've not seen the world in vain."

SILVER-LOCKS AND THE THREE BEARS

Once upon a time in a far-off country, there were three bears who lived together in a snug little house of their own, deep in the woods.

They were the Little Wee Bear, the Middle-Sized Bear and the Great Huge Bear.

Though their house was in a lonely place they were very happy together. Each had a pot for his own porridge: a little pot for the Little Wee Bear, a middle-sized pot for the Middle-Sized Bear, and a great pot for the Great Huge Bear.

Each had a chair to sit in: a little chair for the Little Wee Bear, a middle-sized chair for the Middle-Sized Bear, and a great chair for the Great Huge Bear.

Each had a bed to sleep in: a little bed for the Wee Small Bear, a middle-sized bed for the Middle-Sized Bear, and a great bed for the Great Huge Bear.

Each morning they made porridge for their breakfast. Now it happened one morning that after they had poured the porridge into their pots they found that it was too hot to eat, so they walked out in the woods while it was cooling. If they should begin to eat too soon they would be dreadfully burned.

Now, while they were walking, a little girl named Silver-Locks, whose curly hair shone like silver in the sun, came to the house. I am sorry to say that she was a restless little girl, and she had run away from home that morning without leave.

When she came to the house of the Three Bears, she peeped first in at the window; then she peeped in at the keyhole. Seeing nobody, she lifted the latch and walked in.

You see the Bears were good and kind and they never thought that anybody would harm their house, so they never locked the door when they went walking in the woods.

The first thing that Silver-Locks saw was the porridge cooling in the three bowls. Not stopping to think how naughty it was, she first tasted the porridge in the Great Bear's bowl, but that was too hot for her.

Then she tasted the porridge in the middle-sized bowl, which belonged to the Middle-Sized Bear, but that was too cold for her.

Then she went to the porridge of the Little Wee Bear, and tasted that, and it was neither too hot nor too cold, but just right; and she liked it so well that she ate it all up.

Then she went into the parlor, and there were the three chairs.

She tried the biggest chair, which belonged to the Great Huge Bear, but it was too high.

Then she tried the middle-sized chair, which belonged to the Middle-Sized Bear, but that was too broad.

Then she tried the little chair which belonged to the Little Wee Bear, and that was just right, neither too high nor too broad. But she sat down in it so hard that the bottom came out, and the little chair all fell to pieces.

By this time little Silver-Locks was very tired, so she went upstairs to the sleeping chamber of the Three Bears.

First she lay down upon the bed of the Great Huge Bear, but that was too high at the head for her.

Then she lay down upon the bed of the Middle-Sized Bear, but that was too low at the foot for her.

Then she lay down upon the bed of the Little Wee Bear, and that was neither too high at the head nor too low at the foot, but just right; so she covered herself up and lay there until she was fast asleep.

By this time the Three Bears thought their porridge had cooled enough, so they came in from their walk to eat their breakfast.

But when the Great Huge Bear went to his bowl of porridge he growled out in his great, rough, gruff voice:

"Somebody has been tasting my porridge!"

When the Middle-Sized Bear looked into his bowl he cried out, in his middle-sized voice:

"Somebody has been tasting my porridge!"

Then the Little Wee Bear looked at his porridge bowl and found his porridge all gone, and he cried out in his little wee voice:

SOMEBODY HAD EATEN HIS PORRIDGE

"Somebody has been tasting my porridge and has eaten it all up!"

Then the Three Bears began to look all about them. First they went into the parlor, where the three chairs were.

Now careless little Silver-Locks had forgotten to put the cushion straight when she rose from the chair of the Great Bear.

The Great Huge Bear went to his chair and growled out, in his great, rough, gruff voice:

"Somebody has been sitting in my chair!"

Then the Middle-Sized Bear went to his chair and cried out, in his middle-sized voice:

"Somebody has been sitting in my chair!"

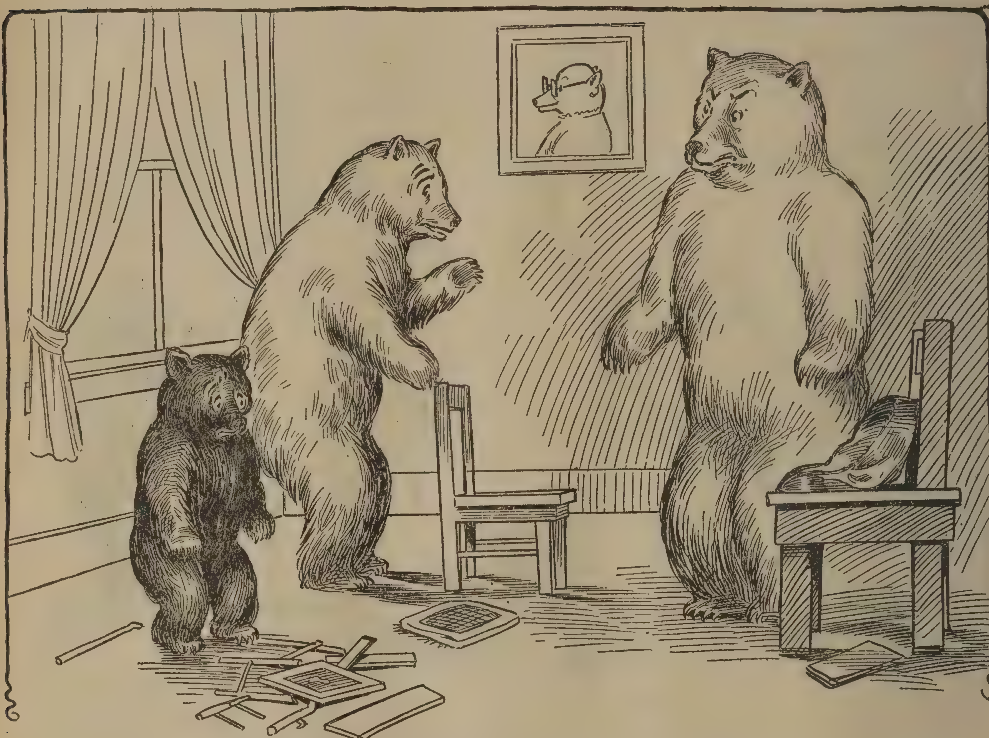
And the Little Wee Bear went to his chair and saw the bottom fallen out, and cried out in his little wee voice:

"Somebody has been sitting in my chair and has broken it all to pieces!"

Then the Three Bears went upstairs to their sleeping chamber.

There the Great Huge Bear growled out in his great, rough, gruff voice:

"Somebody has been lying in my bed!"



Somebody Had Broken His Chair All to Pieces

And the Middle-Sized Bear, in his middle-sized voice, cried out:

"Somebody has been lying in my bed!"

And the Little Wee Bear cried out in his little wee voice:

"Somebody has been lying in my bed—and here she is!"

Now little Silver-Locks had heard in her sleep the great, rough, gruff voice of the Great Huge Bear, but it seemed to her like the roaring of the wind or the rumbling of thunder.

She had heard in her sleep the middle-sized voice of the Middle-Sized Bear, but it sounded like someone speaking in a dream.

"AND HERE SHE IS"

But when she heard the little wee voice of the Little Wee Bear it was so sharp and shrill it waked her at once.

Up she started, and when she saw the Three Bears on one side of the bed she was so frightened that she rolled out on the other side.

Then the Great Huge Bear growled out in his great, rough, gruff voice:

"Let's eat her!"

And the Middle-Sized Bear cried out in his middle-sized voice:

"Let's eat her!"

But the Little Wee Bear cried out, in his little wee voice:

"No, no! let's kiss her and send her home!"

But Silver-Locks, without waiting to hear what they decided to do, jumped out of the window and ran home as fast as her feet would carry her.

LITTLE RED RIDING-HOOD

(Adapted from Charles Perrault)

Once upon a time there lived in a certain village a pretty little country girl who had a grandmother that loved her very dearly. This good woman made for her grand-daughter a little red riding-hood that was so very becoming that everybody called her Little Red Riding-Hood.

One day Little Red Riding-Hood's mother made some delicious custards, and, calling her little girl, said to her, "Go, my dear, and see how thy grandmother does, for I hear she has been very ill; carry her a custard and this little pot of butter."

Little Red Riding-Hood set out at once to go to her grandmother, who lived in another village.

As she was going through the wood, she met with a large Wolf, who had a very great mind to eat her up, but he dared not because of some wood-cutters hard by in the forest.

Yet he spoke to her and asked her whither she was going. The poor child, who did not know that it was dangerous to stay and hear a Wolf talk, said to him:

"I am going to see my grandmother and carry her a custard and a little pot of butter from my mamma."

"Does she live far off?" said the Wolf.

"Oh, yes!" answered Little Red Riding-Hood; "it is beyond that mill you see there, in the first house in the village."

"Well," said Wolf, "I'll go and see her too. I'll go this way and you go that, and we shall see who will be there soonest."

The Wolf began to run as fast as he could, taking the nearest way, and the little girl went by that farthest about, diverting herself in gathering nuts, running after butterflies, and making nosegays of such little flowers as she met with. The Wolf was not long in getting to the old woman's house. He knocked at the door—tap, tap.

"Who's there?"

"Your grandchild, Little Red Riding-Hood," replied the Wolf, counterfeiting her voice; "who has brought you a custard and a little pot of butter sent you by mamma."

The good grandmother, who was in bed, because she was somewhat ill, cried out:

"Pull the bobbin, and the latch will go up."

The Wolf pulled the bobbin, and the door opened, and he walked in. Straightway he fell upon the good woman and in

LITTLE RED RIDING-HOOD AND THE WOLF

a moment had swallowed her up, for it was above three days since he had touched a bit. He then shut the door, put on a nightcap, and went into the grandmother's bed, to await the

arrival of Little Red Riding-Hood. Sometime afterwards she reached the house and knocked at the door—tap, tap.

"Who's there?"

Little Red Riding-Hood, hearing the big voice of the Wolf, was at first afraid; but, believing that her grandmother had got a cold and was hoarse, she answered:

"'Tis your grandchild, Little Red Riding-Hood, who has brought you a custard and a little pot of butter mamma sends you."

The Wolf cried out to her, softening his voice as much as he could:

"Pull the bobbin, and the latch will go up."

Little Red Riding-Hood pulled the bobbin, and the door opened.

The Wolf, seeing her come in, said to her, hiding himself under the bed-clothes:

"Put the custard and the little pot of butter upon the stool, and come and lie down with me."

Then Little Red Riding-Hood came up close to the bed.

"Why grandmother, what great arms you have got!" she said.

The Wolf replied:

"They are so much better to hug you with, my child."

"Grandmother, what great ears you have got!"

"That is to hear you the better, my child."

"Grandmother, what great eyes you have got!"

"They are so much better to see you with, my child."

Then the little girl, who had begun to get very much frightened, said:

"Oh, grandmother, what great teeth you have got!"

Then in his great harsh voice the Wolf cried out:

"That is to eat you up."

Saying this, he sprang out of bed and made for the little girl. But the wood-cutters, who happened to be passing the cottage on their way home, heard Little Red-Riding Hood scream, and they ran into the cottage just in time to kill the Wolf with some good blows from their trusty axes. Then they cut the Wolf open and out stepped the grandmother, quite unharmed. You may be sure that Little Red Riding-Hood never again made friends with a Wolf while on her way to visit her grandmother.

WHY THE BEAR SLEEPS ALL WINTER*

Once upon a time, little Brother Rabbit lived, quite sober and industrious, in the woods, and just close by lived a big, brown Bear.

Now little Brother Rabbit never troubled his neighbors in those days, nor meddled with their housekeeping, nor played any tricks the way he does now. In the fall, he gathered his acorns, and his pignuts, and his rabbit tobacco. On a frosty morning, he would set out with Brother Fox for the farmer's; and while Brother Fox looked after the chicken yards, little Brother Rabbit picked cabbage, and pulled turnips, and gathered carrots and parsnips for his cellar. When the winter came, he never failed to share his store with a wandering chipmunk.

Now, in those days, old Bear was not content to do his own housekeeping, and doze in the sun, and gather wild honey in the summer, and fish through the ice in the winter. He was full of mischief, and was always playing tricks. Of all the beasts of the wood, the one he loved best to trouble was sober little Brother Rabbit.

Just as soon as Brother Rabbit moved to a new tree stump, and filled his bins with vegetables, and his pantry with salad, along came old Bear and carried off all his stores.

Just as soon as Brother Rabbit filled his house with dry, warm leaves for a bed, along came old Bear, and tried to squeeze himself into the bed, too, and of course he was too big.

At last, Brother Rabbit could stand it no longer, and he went to all the beasts in the wood to ask their advice.

The first one he met was Brother Frog, sitting on the edge of the pond, and sticking his feet in the nice, cool mud.

What shall I do, Brother Frog?" asked Brother Rabbit; "Brother Bear will not leave me alone."

"Let us ask Brother Squirrel," said Brother Frog.

So the two went to Brother Squirrel, cracking nuts in the hickory tree.

"What shall we do, Brother Squirrel?" asked Brother Frog; "Brother Bear will not leave Brother Rabbit alone."

"Let us ask Brother Mole," said Brother Squirrel, dropping his nuts.

So the three went to where Brother Mole was digging the cellar for a new house, and they said:

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*From *Firelight Stories,* by Carolyn Sherwin Bailey (Milton Bradley Company). By permission of the publishers.

THEY FIND BROTHER BEAR ASLEEP IN A LOG

"What shall we do, Brother Mole? Brother Bear will not leave Brother Rabbit alone."

"Let us ask Brother Fox," said Brother Mole.

So Brother Mole, Brother Squirrel, Brother Frog, and Brother Rabbit went to where Brother Fox was combing his brush behind a bush, and they said to him:

"What shall we do, Brother Fox? Brother Bear will not leave Brother Rabbit alone."

"Let us go to Brother Bear," said Brother Fox.

So they all went along with little Brother Rabbit, and they hunted and hunted for old Bear, but they could not find him

anywhere. They hunted and hunted some more, and at last they peeped into a hollow tree. There lay old Bear, fast asleep.

"Hush," said Brother Fox.

Then he whispered to Brother Frog, "Bring a little mud."

And he whispered to Brother Squirrel, "Bring some leaves."

And he whispered to Brother Mole, "Bring some dirt, little brother."

And to Brother Rabbit he said, "Stand ready to do what I tell you."

So Brother Frog brought mud, Brother Squirrel brought leaves, Brother Mole brought dirt, and Brother Rabbit stood ready to do what Brother Fox told him.

Then Brother Fox said to Brother Rabbit, "Stop up the ends of Brother Bear's log."

So Brother Rabbit took the mud and the leaves and the dirt, and he stopped up the ends of the log. Then he hammered hard with his two back feet, which are good for hammering. And they all went home, for they thought that old Bear would never, never get out of the log.

Well, old Bear slept and slept, but after a while he awoke, and he opened one eye. He saw no sunshine, so he thought it was still night, and he went to sleep again.

After another while, he awoke again, but he heard the rain and sleet beating outside, and it was very warm and dry inside.

"What a very long night," said old Bear, and he curled up his paws, and he went to sleep again.

This time, he just slept, and slept, until it began to be very warm inside the log, and he heard in his dreams the footsteps of birds outside.

Then he awoke, and he stretched himself, and he shook himself. He rubbed his eyes with his paws, and he poked away the mud, and the leaves, and the dirt, and he went outside.

But was he not surprised?

It had been a frosty night when he had gone to sleep, and now the woods were green. Old Bear had slept all winter.

"That was a fine long sleep," said old Bear, as he set out for little Brother Rabbit's house to see if he had anything good for breakfast; "and I shall go to sleep again, next fall."

So every summer, old Bear plays tricks on little Brother Rabbit, but when fall comes, he creeps away to a warm, dark place to sleep until spring.

And so have his grandchildren, and his great-grandchildren, and his great-great-grandchildren ever since.

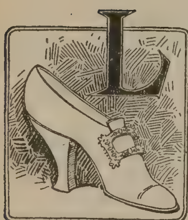
SELECTED STORIES TO TELL TO EVERYONE

FAIRY TALES

The three fairy tales here presented, from the French, German and Danish, respectively, are representative of the best of this class of literature. Good fairy tales, with their appeal to the imagination and the emotions, and their underlying spiritual truths, combine so many excellent qualities that they should have an important place in the story teller's list of tales.

CINDERELLA OR THE LITTLE GLASS SLIPPER

(Adapted from Charles Perrault)



LONG ago there lived a rich gentleman whose loving wife died quite suddenly, leaving in his care a gentle and beautiful daughter who was the very picture of her mother. In the course of time this gentleman married again. Now his second wife was a proud and haughty woman who had two daughters by a former husband, and the two daughters were exactly like their mother. The gentleman did not know the real nature of the lady he married, for he thought she would be a kind and loving mother to his little girl.

No sooner were the wedding ceremonies over but the wife began to show herself in her true colors. She could not bear the good qualities of her pretty little stepdaughter, and she compelled her to do the meanest work of the house: the poor girl had to scour the dishes and polish the tables and chairs, and it was her place always to scrub the sleeping rooms of the lady and her daughters, while she herself slept in a dismal garret upon a wretched straw bed. Her sisters lay in fine rooms, with floors all inlaid, upon beds of the very newest fashion, and where they had looking-glasses so large that they should see themselves at full length from head to foot.

The father was so completely under the control of his wife that the little girl did not dare complain. So, when she had finished her work she used to go into the chimney corner and sit down among the cinders and ashes; here she got so dusty that the older daughter called her the *cinder-girl.* The younger, who was not quite so unkind as her sister, called her Cinderella, and by this name she was soon known by all her family and the neighbors.

It came to pass that the King's son gave a ball, to which he invited all the persons of fashion for miles around. Cinderella's two sisters were invited, and they spent many days in planning their gowns and shoes and headdresses, for they hoped to make themselves as attractive as possible to the young Prince. Cinderella, who ironed and plaited her sisters' linen and worked for long hours over their dresses, had to listen to their talk without any hope of sharing the fun with them.

"For my part," said the elder, "I will wear my red velvet suit with French trimming."

"And I," said the younger, "shall have my usual petticoat; but then, to make amends for that, I will put on my gold-flowered muslin train and my diamond stomacher, which is far from being the most ordinary one in the world."

They sent for the best hairdresser they could get to make up their headdresses, and they bought many jewels and ornaments of fashionable shapes.

Cinderella was often called up to them to be consulted, for she had very good taste and advised them always for the best.

CINDERELLA AND HER PROUD SISTERS

"Ah, Cinderella," said one of the sisters, "would you not like to go to the ball?"

"Alas," said she, "you only jeer at me; it is not for such as I am to go to the Prince's ball."

"You are right about that," replied the two, "for everyone would laugh in-

CINDERELLA AND HER GODMOTHER

deed to see a cinder-girl come into the ball room."

Anyone but Cinderella would have spoiled the costumes of the proud sisters, but she was too unselfish to even think of doing anything unkind.

At last the happy day came and the sisters went to the court ball, while Cinderella followed them with her eyes as long as she could. When she had lost sight of them she sat down in her dusty corner and began to cry.

Her godmother, coming in just then, saw her all in tears, and asked her what was the matter.

"I wish I could—I wish I could—" she was not able to speak the rest, because of her tears and sobbing.

This godmother of hers, who was a fairy, said to her, "You wish you could go to the ball; is it not so?"

"Ah, yes!" said Cinderella with a sigh.

"Well," said her godmother, "be a good girl, and I will bring it about that you shall go. Run into the garden and bring me a pumpkin."

Cinderella ran to the garden as fast as she could, plucked the finest pumpkin she could find and brought it to her godmother, not being able to imagine how this could help her go to the ball. Her godmother scooped out the inside, leaving nothing but the rind, and then with the wand which she carried she tapped the pumpkin gently three times. Instantly it was turned into a fine coach, gilded all over with gold.

She then went to look into her mousetrap, where she found six mice, all alive, and ordered Cinderella to lift up a little the trap-door.

As the mice ran out, one by one, the fairy godmother touched them with the wand, and at each tap a mouse was turned into a fine dapple-gray horse. Here was a splendid coach and six, but there was no coachman.

"I will look in the rat-trap," said Cinderella, "perhaps we may find a rat for a coachman."

So she ran eagerly to the trap and was overjoyed to find that it contained three of the largest rats she had ever seen. The fairy chose the largest and touched him with her wand. Instantly he was changed into a handsome coachman with the finest whiskers you would care to see.

Then said the godmother, "Go into the garden and you will find six lizards behind the watering-pot; bring them to me."

Cinderella had no sooner done so than her godmother turned them into six footmen, who at once jumped up behind the coach, and in their fine livery of lace and gold were as sober and dignified as if they had been footmen all their lives.

"Well," said the fairy to Cinderella, "you see here an equipage fit to go to the ball with; are you not pleased with it?"

"Oh! yes," cried she; "but must I go thither as I am, in these kitchen rags?"

In reply, her godmother touched her with the wand, and her rags were instantly changed into the most wonderful gown of gold and silver, all beset with jewels. To all this was added a beautiful pair of glass slippers.

"Now," said the godmother, "go and enjoy yourself, but remember not to stay at the ball after the clock strikes twelve. If you remain a single moment after that time, your coach, and horses and footmen will become as they were before."

She promised her godmother she would not fail of leaving the ball before midnight, and then away she drove, scarce able to contain herself with joy. The King's son, who was told that a great Princess, whom nobody knew, was come, ran out to receive her. He gave her his hand as she alighted out of the coach, and led her into the hall, among all the company. There was immediately a profound silence, they left off dancing, and the violins ceased to play, so eager was everyone to gaze upon the beauty and charm of the lovely newcomer. When he led her out to dance with him there was still greater admiration, for no one had ever seen so graceful a dancer. When, later, the rich supper was spread, the Prince could not eat a morsel of the delicious foods, so occupied was he in gazing upon her.

Cinderella showed her sisters many attentions, giving them part of the oranges and citrons which the Prince had presented her. You can imagine how surprised they were, for they did not in the least know who she was. While she was thus amusing her sisters, the clock struck eleven and three-quarters, whereupon she made a courtesy to the company and hastened away as fast as she could.

As soon as she arrived at home she sought out her godmother, whom she thanked a thousand times for giving her this delightful evening. Just as she was saying that she would give anything to be able to go to the ball the next day, she heard her sisters knocking at the door.

"How long you have stayed," said she, as she opened the door; and she rubbed her eyes and stretched herself exactly as if she had just awakened out of a sound sleep.

"If you had been at the ball," said one of the sisters, "you would have not been tired with it. There came thither the finest Princess that ever was seen by mortal eyes; she showed us a thousand attentions and gave us oranges and citrons."

Cinderella asked them the name of the beautiful Princess, but they told her they did not know it, and that the King's son would give all the world to know who she was. Then said Cinderella, smiling:

"She must, then, be very beautiful indeed; how happy you have been! Could not I see her? Ah, dear sister, do lend me your yellow gown which you wear every day!"

"What! lend my clothes to such a dirty cinder-girl," cried the elder sister; "I should be a fool to do so."

You may be sure that Cinderella was glad to be refused, for she would have been sadly put to it if her sister had lent her what she asked for so jestingly.

The next day the two sisters were at the ball, and again Cinderella appeared, but in still more magnificent garments. The King's son was always by her, never ceasing his compliments and kind speeches to her; indeed, she became so absorbed in the charming Prince and his flattering words that she entirely forgot what her godmother had told her about returning at midnight.

In the midst of her happiness the clock began to strike—one, two, three! Then was her joy changed to terrible alarm for the strokes counted up to twelve. Jumping to her feet, she fled from the room so swiftly that even the Prince could not overtake her. But in her great haste she lost one of her glass slippers, and she dared not turn back to get it. The Prince, returning to the ball room, saw the pretty little shoe, and picked it up. When Cinderella reached home, tired and breathless, all she had left of the fine equipage and costly garments was the mate to her lost glass slipper.

In the meantime the Prince had questioned all the guards at his palace gates, asking if anyone had seen a beautiful Princess pass out. But the guards said they had seen only a ragged little beggar girl who had run through about midnight.

When the sisters arrived home from the ball, how eagerly did Cinderella question them about the mysterious Princess!

"Yes, she was there," they told her, "but at midnight she jumped up and ran so hurriedly from the ball room that she did not stop even to pick up one of her glass slippers which she lost. The Prince could not overtake her, much to his sorrow, but he found the little slipper, and he sat gazing at this all the rest of the night. Indeed, he must be very much in love with her."

The next day the Prince sent heralds around, who announced by sound of trumpet that he would make his wife the lady whose foot exactly fitted the slipper he had found. The messengers of the Prince took the slipper and carried it to all the ladies of the royal family, and then to the duchesses, and then to all the high court ladies, but no one could be found who could wear the slipper. Finally they came to the home of Cinderella, and how eagerly did each of the haughty sisters try to squeeze her foot into the dainty little slipper!

Then Cinderella, who was looking on, and knew that this was her own slipper, said:

"Let me see if it will not fit me."

The sisters laughed at her with scorn, but the messenger, who noticed that Cinderella was very beautiful, said that she could try, for he had orders to refuse none who wished to make the trial. The Prince had indeed given orders that if necessary it would be tried on the foot of every lady in the land.

So Cinderella sat down, and when the gentleman tried on the slipper he was astonished to find that it fitted her foot

like wax. The sisters, too, were surprised beyond measure, especially when they saw her reach her hand into her pocket and take out the other slipper, which she put on her other foot. Just then the fairy godmother came into the room, quickly approached Cinderella and touched her with her wand. In an instant's time the ragged dress was changed to a beautiful garment, and the charming Princess of the royal ball stood before them.

Then the sisters fell at her feet and begged forgiveness for the insults and the ill treatment they had heaped upon her. Cinderella, giving them each a hand and bidding them arise, tenderly embraced them and said:

"I forgive you with all my heart, and I hope we shall always love one another."

Then she was conducted to the presence of the Prince, who was so overjoyed to find his Princess of the glass slipper that he asked for her hand at once. In a few days the marriage ceremony took place, and Cinderella, forgiving and gentle still in her great happiness and good fortune, provided her sisters with handsome apartments in the palace. Here they were soon after married to rich nobles of the court.

THE SLEEPING BEAUTY

Jacob and Wilhelm Grimm

In times past there lived a King and Queen, who said to each other every day of their lives, "Would that we had a child!" and yet they had none. But it happened once that when the Queen was bathing, there came a frog out of the water, and he squatted on the ground, and said to her,

"Thy wish shall be fulfilled; before a year has gone by, thou shalt bring a daughter into the world."

And as the frog foretold, so it happened; and the Queen bore a daughter so beautiful that the King could not contain himself for joy, and he ordained a great feast. Not only did he bid to it his relations, friends, and acquaintances, but also the wise women, that they might be kind and favorable to the child. There were thirteen of them in his kingdom, but as he had provided only twelve golden plates for them to eat from, one of them had to be left out. However, the feast was celebrated with all splendor; and as it drew to an end, the wise women stepped forward to present to the child their wonderful gifts: one bestowed virtue, one beauty, a third riches, and so on, whatever there is in the world to wish for. And when eleven of them had said their say, in came the uninvited thirteenth, burning to revenge herself, and, without greeting or respect, she cried with a loud voice:

"In the fifteenth year of her age the Princess shall prick herself with a spindle and shall fall down dead."

And without speaking one more word she turned away and left the hall. Everyone was terrified at her saying, when the twelfth came forward; now she had not yet bestowed her gift, and though she could not do away with the evil prophecy, yet she could soften it, so she said:

"The Princess shall not die, but fall into a deep sleep for a hundred years."

Now the King, being desirous of saving his child even from this misfortune, gave commandment that all the spindles in his kingdom should be burnt up.

The maiden grew up, adorned with all the gifts of the wise women; and she was so lovely, modest, sweet, and kind and clever, that no one who saw her could help loving her.

It happened one day, she being already fifteen years old, that the King and Queen rode abroad, and the maiden was left behind alone in the castle. She wandered about into all the nooks and corners, and into all the chambers and parlors, as the fancy took her, till at last

she came to an old tower. She climbed the narrow winding stair which led to a little door, with a rusty key sticking out of the lock; she turned the key, and the door opened, and there in the little room sat an old woman with a spindle, diligently spinning her flax.

"Good day, mother," said the Princess, "what are you doing?"

"I am spinning," answered the old woman, nodding her head.

"What thing is that that twists round so briskly?" asked the maiden, and taking the spindle into her hand she began to spin; but no sooner had she touched it than the evil prophecy was fulfilled, and she pricked her finger with it. In that very moment she fell back upon the bed that stood there, and lay in a deep sleep. And this sleep fell upon the whole castle; the King and Queen, who had returned and were in the great hall, fell fast asleep, and with them the whole court. The horses in their stalls, the dogs in the yard, the pigeons on the roof, the flies on the wall, the very fire that flickered on the hearth, became still, and slept like the rest; and the meat on the spit ceased roasting, and the cook, who was going to pull the scullion's hair for some mistake he had made, let him go, and went to sleep. And the wind ceased, and not a leaf fell from the trees about the castle.

Then round about that place there grew a hedge of thorns thicker every year, until at last the whole castle was hidden from view, and nothing of it could be seen but the vane on the roof. And a rumor went abroad in all that country of the beautiful sleeping Rosamond, for so was the Princess called; and from time to time many kings' sons came and tried to force their way through the hedge; but it was impossible for them to do so, for the thorns held fast together like strong hands, and the young men were caught by them, and not being able to get free, there died a lamentable death.

Many a long year afterwards there came a King's son into that country, and heard an old man tell how there should be a castle standing, behind the hedge of thorns, and that there a beautiful enchanted Princess named Rosamond had slept for a hundred years, and with her the King and Queen, and the whole court. The old man had been told by his grandfather that many kings' sons had sought to pass the thorn-hedge, but had been caught and pierced by the thorns, and had died a miserable death. Then said the young man, "Nevertheless, I do not fear to try; I shall win through and see the lovely Rosamond." The good old man tried to dissuade him, but he would not listen to his words.

For now the hundred years were at an end, and the day had come when Rosamond should be awakened. When the Prince drew near the hedge of thorns, it was changed into a hedge of beautiful large flowers, which parted and bent aside to let him pass, and then closed behind him in a thick hedge. When he reached the castle-yard, he saw the horses and brindled hunting-dogs lying asleep, and on the roof the pigeons were sitting with their heads under their wings. And when he came indoors, the flies on the wall were asleep, the cook in the kitchen had his hand uplifted to strike the scullion, and the kitchen-maid had the black fowl on her lap ready to pluck. Then he mounted higher, and saw in the hall the whole court lying asleep, and above them, on their thrones, slept the King and the Queen.

And still he went farther, and all was so quiet that he could hear his own breathing; and at last he came to the tower, and went up the winding stair, and opened the door of the little room where Rosamond lay. And when he saw her looking so lovely in her sleep, he could not turn away his eyes; and presently he stooped and kissed her, and she waked, and opened her eyes, and looked very kindly on him. And she rose, and they went forth together, and the King and the Queen and the whole court waked up, and gazed on each other with great eyes of wonderment. And the horses in the yard got up and shook themselves, the hounds sprang up and

wagged their tails, the pigeons on the roof drew their heads from under their wings, looked round, and flew into the field, the flies on the wall crept on a little farther, the kitchen fire leapt up and blazed, and cooked the meat, the joint on the spit began to roast, the cook gave the scullion such a box on the ear that he roared out, and the maid went on plucking the fowl.

Then the wedding of the Prince and Rosamond was held with all splendor, and they lived very happily together until their lives' end.

THE LITTLE MATCH GIRL

Hans Christian Andersen

It was terribly cold; it snowed and was already almost dark, and evening came on, the last evening of the year. In the cold and gloom a poor little girl, bareheaded and barefoot, was walking through the streets. When she left her own house she certainly had had slippers on; but of what use were they? They were big slippers, and her mother had used them till then, so big were they. The little maid lost them as she slipped across the road, where two carriages were rattling by terribly fast. One slipper was not to be found again, and a boy had seized the other, and run away with it. He thought he could use it very well as a cradle, some day when he had children of his own. So now the little girl went with her little naked feet, which were quite red and blue with the cold. In an old apron she carried a number of matches, and a bundle of them in her hand. No one had bought of her all day, and no one had given her a farthing.

Shivering with cold and hunger, she crept along, a picture of misery, poor little girl! The snowflakes covered her long fair hair, which fell in pretty curls over her neck; but she did not think of that now. In all the windows lights were shining, and there was a glorious smell of roast goose, for it was New Year's Eve. Yes, she thought of that!

In a corner formed by two houses, one of which projected beyond the other, she sat down, cowering. She had drawn up her little feet, but she was still colder, and she did not dare to go home, for she had sold no matches, and did not bring a farthing of money. From her father she would certainly receive a beating, and besides it was cold at home, for they had nothing over them but a roof through which the wind whistled, though the largest rents had been stopped with straw and rags.

Her little hands were almost benumbed with the cold! Ah! a match might do her good, if she could only draw one from the bundle, and rub it against the wall, and warm her hands at it. She drew one out. R-r-atch! how it sputtered and burned! It was a warm, bright flame, like a little candle when she held her hands over it; it was a wonderful little light! It really seemed to the little girl as if she sat before a great polished stove, with bright brass feet and a brass cover. How the fire burned! how comfortable it was! But the little flame went out, and the stove vanished, and she had only the remains of the burned match in her hand.

A second was rubbed against the wall. It burned up, and when the light fell upon the wall it became transparent, like a thin veil, and she could see through it into the room. On the table a snow-white cloth was spread; upon it stood a shining dinner service; the roast goose smoked gloriously, stuffed with apples and dried plums. And what was still more splendid to behold, the goose hopped down from the dish, and waddled along the floor, with a knife and fork in its breast, to the little girl. Then the match went out, and only the thick, damp, cold wall was before her. She lighted another match. Then she was sitting under a beautiful Christmas tree; it was greater and more ornamental than

THEN SHE WAS SITTING UNDER A BEAUTIFUL CHRISTMAS TREE

the one she had seen through the glass door at the rich merchant's. Thousands of candles burned upon the green branches, and colored pictures like those in the print shops looked down upon them. The little girl stretched forth her hand toward them; then the match went out. The Christmas lights mounted higher. She saw them now as stars in the sky; one of them fell down, forming a long line of fire.

"Now someone is dying," thought the little girl, for her old grandmother, the only person who had loved her, and who was now dead, had told her when a star fell down a soul mounted up to God. She rubbed another match against the wall; it became bright again, and in the brightness the old grandmother stood clear and shining, mild and lovely.

"Grandmother!" cried the child, "oh! take me with you! I know you will go when the match is burned out. You will vanish like the warm fire, the warm food, and the great glorious Christmas tree!"

And she hastily rubbed the whole bundle of matches, for she wished to hold her grandmother fast. And the matches burned with such a glow that it became brighter than in the middle of the day: grandmother had never been so large or so beautiful. She took the little girl in her arms, and both flew in brightness and joy above the earth, very, very high, and up there was neither cold, nor hunger, nor care—they were with God!

But in the corner, leaning against the wall, sat the poor girl with red cheeks and smiling mouth, frozen to death on the last evening of the Old Year. The New Year's sun rose upon a little corpse! The child sat there, stiff and cold, with the matches of which one bundle was burned. "She wanted to warm herself," the people said. No one imagined what a beautiful thing she had seen, and in what glory she had gone in with her grandmother to the New Year's Day.

FABLES

The ancients loved to write stories that taught a lesson of some kind, and this type of story has never lost its charm. The old fable usually had the *moral* stated at the end. Fables are the child's best introduction to the study of human nature; they interpret life. At the same time, their quaint humor, simplicity and brevity make them very adaptable to the purpose of imparting moral truths.

THE DOG AND HIS SHADOW

A big Dog was one day carrying a big piece of meat in his mouth. While crossing a river on a narrow bridge he chanced to look down into the water and there saw his own image reflected. Thinking that it was another dog with a bigger piece of meat, he opened his mouth to grab the other's piece, and lost his own in the river.

* * *

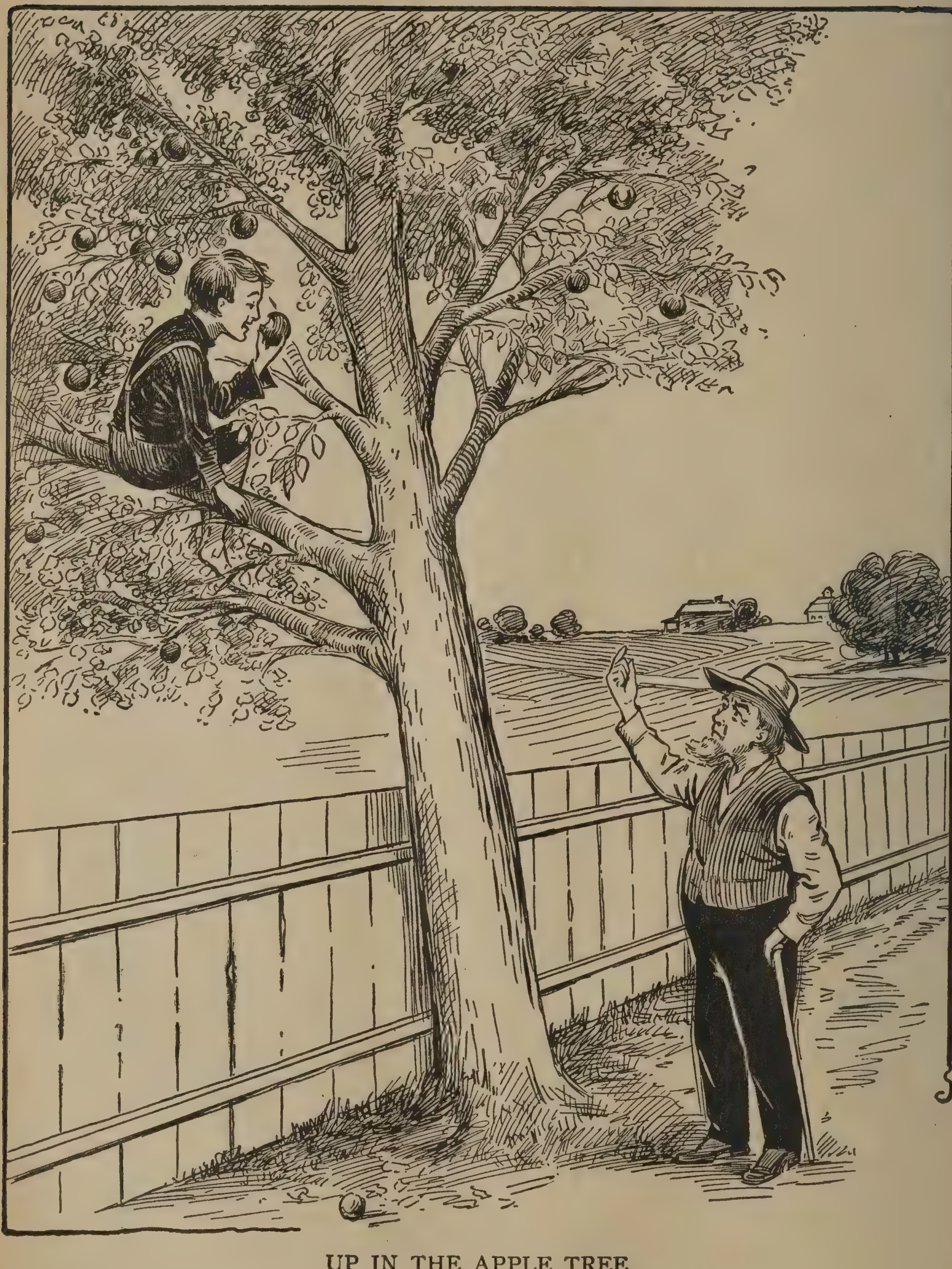
Those who are greedy and try to get what belongs to their neighbors often lose what they already possess.

THE GNAT AND THE BULL

A Gnat, flying about in the sunshine, alighted on one of the horns of a Bull. After resting there for some time, he said to the Bull: "I thank you for your patience in allowing me to rest on your horn. Do you mind if I leave you now?" "It's all one to me," said the Bull, lazily raising his eyes. "I didn't know you were there and I shan't know it when you go."

* * *

When we overvalue our own importance we make ourselves ridiculous.



UP IN THE APPLE TREE

THE ASS IN THE LION'S SKIN

An Ass dressed himself in a lion's skin and went about frightening the little animals with his roaring. After awhile he met a Fox and tried to scare him in the same way. But the crafty Fox, not at all frightened, called out to the Ass, "You silly creature; I might have been frightened if I had not heard you bray and seen your long ears sticking out of the skin of that lion."

* * *

If we talk and act foolishly no amount of fine clothing can make others think we are wise and sensible.

THE BOY AND THE APPLES

An old man who owned a fine apple orchard found a rude boy upon a branch of one of his trees, eating some of the choicest fruit. When the man ordered the boy to come down the youngster told him plainly that he would not. "Won't you?" said the old man; "then I will fetch you down." So he pulled up some tufts of grass and began to throw them at him. But it only made the saucy youngster laugh to think that the old man should pretend to beat him down from the tree with such light weapons. "Well, well," said the old man, "if neither words nor grass will do, I must try what virtue there is in stones." Then he pelted him vigorously with stones, which soon made the young chap hasten down from the tree and beg the old man's pardon.

* * *

If kind words and gentle means will not reclaim the disobedient, they must be dealt with in a more severe manner.

THE OLD MAN AND HIS SONS

An old man who had several sons became very much grieved because of their constant quarreling. Though he often called them before him and begged them to live together peaceably, his words made no impression at all. Finally he decided to give them an object lesson. Having tied together a bundle of as many sticks as he had sons, he called them before him. Then to the youngest he said, "Take this bundle of sticks and break it." Though the youngest exerted all his strength he could not break the bundle, nor could any of the others, not even the oldest and strongest. Then the father cut the cord that bound the sticks together and handed a single stick to each son. "Now try to break them," he said. Each son succeeded in breaking his stick with perfect ease. "See, my sons!" said the old man. "Such is the power of unity. If you join together in brotherly love, no human opposition can harm you; disunited, you will surely fall a prey to your enemies."

* * *

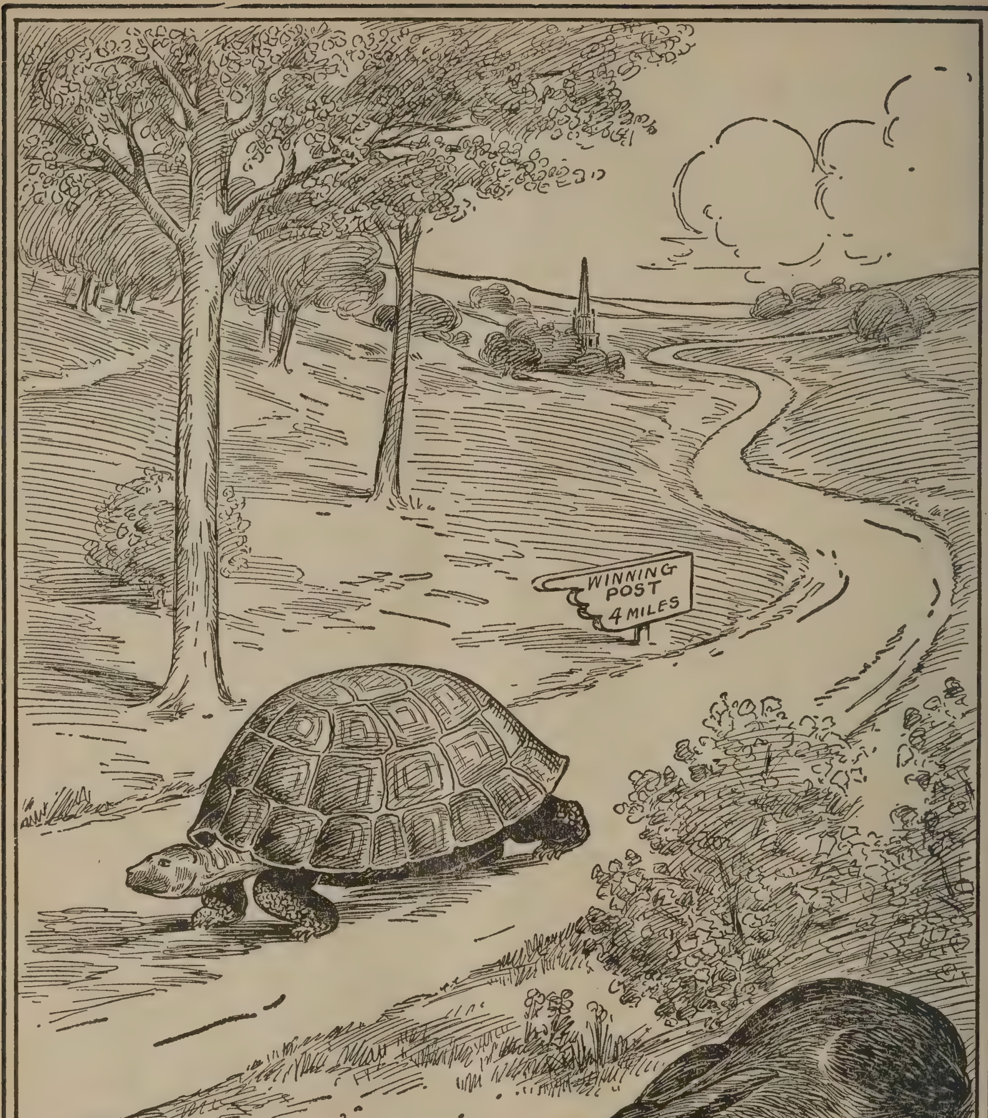
The moral of this little story is stated in the father's words.

THE NORTH WIND AND THE SUN

The North Wind and the Sun had a dispute as to which was the stronger. At last they agreed to try their powers upon a traveler, to see which could soonest strip him of his cloak. The North Wind made the first attempt, and, gathering up all his force for the attack, he beat furiously down upon the man, and caught up his cloak as though he would wrest it from him by a single effort. The harder he blew, however, the more closely did the man wrap it about him. Then the Sun's turn came. At first he sent gentle beams down upon the traveler, who soon unclasped his cloak and walked on with it hanging loosely about his shoulders. Then he shone brighter and brighter, until he was shining forth in his full strength; and the man, before he had gone much farther, was glad to throw off his cloak and finish his journey more lightly clad.

* * *

Persuasion is better than force.


WINNING
POST
4 MILES
The Hare and the Tortoise

THE HARE AND THE TORTOISE

A Hare met a Tortoise on the road one day, and at once began to make fun of his awkward movements and slow gait. "Ugly and slow I may be," said the Tortoise, "but I can beat you in a race to the next river." Oh, how the Hare laughed at this! So loudly did he laugh that a Fox passing by stopped to see what was the cause of the uproar. The Hare told him about the race and asked him to be the judge and hold the stakes.

Then the race began, and of course the Hare was soon out of sight. But it was a hot day and the road was dusty, and he said to himself, "Why should I be in such a hurry? I will rest awhile, and if the Tortoise catches up I can easily beat him anyway." So he lay down and was soon fast asleep. The Tortoise, meanwhile, was plodding on, steady and slow, never stopping for a minute's rest.

Late in the afternoon the Hare awoke. He looked in both directions along the road, but his rival was nowhere to be seen. "Well," said he, "how long is it going to take that slow fellow to catch up? I think I'll rest a little longer." So he turned over and finished his nap. About half an hour later he yawned, stretched himself and lazily made for the road. What was his dismay to see in the dust the tracks of the Tortoise *leading toward the river.*

Off he went like a flash, but when he arrived at the end of the course, panting and breathless, there he found the Tortoise calmly awaiting his coming.

"Steady going wins the race," said the Fox, handing the stakes to the Tortoise.

* * *

It isn't so much how fast we go, but how steadily. The person who sticks to his task will accomplish more than he who works by "fits and starts."

THE SLAVE AND THE LION

A Slave, who was most cruelly treated, ran away from his master, and to avoid capture betook himself into a desert. As he was wandering about in search of food and shelter he came upon an empty cave, in which he took refuge. The cave, however, was a Lion's den, and, to his great horror, almost immediately the Lion himself appeared. The Slave gave himself up for lost, but to his amazement the Lion, instead of springing upon him and devouring him, came and fawned upon him, at the same time whining and lifting up his paw. The Slave, on examining the paw, which he noticed was much swollen, found embedded in the ball of the foot a large thorn. This he at once removed, and then he dressed the wound as well as he could. Soon the wounded paw was as well as ever, and the Lion and Slave shared the cave together, the best of friends.

At last, however, the Slave began to feel lonesome for the society of his fellowmen, and he bade farewell to the Lion and returned to town. In a short time he was recognized and carried off in chains to his former master, who, to make an example of him, ordered that he be thrown to the beasts at the next public spectacle in the theater. On the appointed day the beasts were loosed into the arena, and among the rest a Lion of huge bulk and ferocious aspect. Then the unfortunate Slave was cast in among them. What was the amazement of the spectators, when the ferocious Lion, after one glance, bounded up to the Slave and fawned upon him with every evidence of affection and delight! It was the Lion he had befriended in the cave. The audience clamored that the Slave's life should be spared; and the Governor of the town, marveling at such gratitude and fidelity in a beast, decreed that both should receive their liberty.

* * *

We never can foretell the results of an act of kindness. When we least expect it we may be repaid tenfold.

STORIES FROM THE GERMAN

The four stories in this group were adapted from the German by Professor C. E. Patzer, of the Milwaukee State Normal School.

THE MASTER MISER

A miser who lived in Kufa heard that in Bassora could be found a greater miser than he was. He determined to pay him a visit. When he came in the presence of this miser he declared that he was anxious to become a pupil of so great a miser.

"You are welcome," said the miser of Bassora. "Let us go immediately to the market to make purchases for the day."

They went to the baker. "Have you good bread?" asked the miser. "Yes, indeed," answered the baker, "it is as fresh and soft as butter."

"You see," said the miser of Bassora, "that butter is better than bread with which it is compared. It will be better if we buy some butter."

They proceeded to a creamery and asked whether good butter could be obtained there. "Yes," answered the shop keeper, "my butter is as fresh and sweet as the best olive oil."

"You see," said the host to his guest, "the best butter is compared to olive oil, which must be better than butter."

So they went to a dealer in olive oil. "Have you good olive oil?" he was asked.

"The best in the market," the dealer replied, "it is as clear and as bright as water."

"Ah!" said the miser of Bassora to the one from Kufa, "then water is the best food. I have plenty of that at home, and it will give me great pleasure to serve you generously with it."

And so he placed before his guest nothing but water, because he thought he had proved that water was better than olive oil, better than butter, and better than bread.

"I am happy to know," said the miser of Kufa to the miser of Bassora, "that I have not made my journey in vain. I have learned something which will be of much value to me."

THE KINGDOM OF HEAVEN

One day a King who was much beloved by the people stopped in a small village to have his carriage repaired.

Meanwhile he stepped into the little school to see the children at their tasks.

The King listened attentively to the reading, the singing and other exercises, and then asked permission of the teacher to put a few questions to the pupils.

"Certainly, your majesty," answered the old teacher, making a deep bow.

"Now, children," said the King in a kindly tone, "since you have answered the questions of your teacher so well, I am sure you will also be able to answer my questions."

He then took an apple from his pocket and said, "To which kingdom does this apple belong?"

The children hesitated, for they were a little in awe of their great King. The King, however, waited patiently for an answer. Looking around the room he saw a little girl with bright blue eyes and he said to her, "Can you tell me, little girl, to which kingdom this apple belongs?"

The little girl answered promptly, "It belongs to the vegetable kingdom, my Lord."

"That is the correct answer, and you have done well."

Taking a gold piece out of his pocket and holding it up before the pupils he said, "Can anyone tell me to which kingdom this gold piece belongs?"

For a time no one answered, but finally the little girl with the blue eyes said tim-

idly, "To the mineral kingdom, Lord King."

"You have again answered correctly," the King called out joyously. "I have only one more question to ask. To what kingdom do I belong?"

The King waited a long time but no one tried to answer his question. He repeated the question but still no answer. Finally his eyes again rested on the little girl, and he said to her in a kindly manner, "Now, my child, you have answered the other questions and I am sure you can answer this one also. Won't you try?"

"I know the answer, Lord King," replied the girl, and then she blushed and was silent.

"Well, then," continued the King, "what is it?"

The little girl hesitated because she did not like to say her King belonged to the animal kingdom. That would be impolite, she thought. Suddenly she looked up and said in a clear voice, "You belong to the kingdom of heaven, O King."

This unexpected answer so affected the King that, with tears in his eyes, he said, "Let us hope, my child, I may some time go to that kingdom."

THE TRAVELS OF A PURSE

Three friends made a compact that no matter what might befall them they would help one another as though the three were one. They lived in different cities and met occasionally to discuss their experiences and to renew the pledges of their friendship.

It happened one time that one of the friends was in need of money, which, though not particularly pressing, nevertheless caused him not a little uneasiness. He accordingly wrote to the friend who lived nearest him and asked him for the required sum.

On the following day he received the amount he had asked for. The purse which contained the money was sealed, and without examining it he laid it aside. Soon after this a special messenger arrived from the other friend with a written request that he send him by the bearer all the money he could possibly spare.

"He is in greater need than I am," thought the ingenuous friend, and without much reflection handed the purse to the messenger. But late in the evening of the following day the friend from whom he had borrowed the money stepped into the room and handed him the very purse which he had sent to their mutual friend.

"You see," said his friend, "why I have come to you. This purse was sent to me. It is in the same condition that it was when I first sent it to you. I could not understand what had happened. Tell me what you did with the purse I sent you."

"Do not be angry," said the friend, "I had not broken the seal of the purse, when our mutual friend, by means of a messenger, asked me to send him what money I could spare. So I sent him the purse you had sent me. But how do you come to have the purse in your possession?"

"Oh, everything is clear to me now," he said; "I sent you all the money I had, and fearing to be embarrassed myself I wrote to our friend to send me some money. He probably had no ready money and hence appealed to you, and you in your eagerness to assist him, sent him the purse I had sent you. Thus it was that my purse came back to me. Take the money and use it. You need it more than we do. How beautiful it is that we three are so willing to help one another!"

KANNITVERSTAN

A number of years ago a young journeyman shoemaker from Germany, in his wanderings, reached Amsterdam, the metropolis of Holland. Soon after his arrival in that city of great buildings, large ships and busy people, a beautiful mansion caught his eye, the like of which he had not seen in all his travels.

For a long time he gazed with admiration at this magnificent structure, with its high windows, larger even than the doors in his father's house. Finally he could not resist the temptation to address a passer-by. "Pardon me," he said, "can you tell me the name of the man who owns this beautiful mansion with its windows full of tulips and star flowers and orchids?" But the man did not understand German and so answered briefly, "Kannitverstan," and hurried on.

Now, "Kannitverstan" was a Dutch word, or rather three, and meant "I cannot understand you." But the simple-minded traveler thought it was the name of the man about whom he had inquired. He thought "Kannitverstan" must be a very wealthy man and passed on.

After walking about for some time he reached the harbor. There he saw so many ships and such a great number of masts that he was almost bewildered. Finally his attention was directed to a large vessel which had but lately arrived from the East Indies and was being unloaded. Already there were rows upon rows of boxes and bales on the wharf, which had come from the hold of the vessel, and still the men continued to bring out more boxes and bales, together with bags of sugar, coffee, rice and pepper.

After he had looked on a long time he asked a laborer, who was hurrying along with a box on his shoulder, to tell him the name of the man to whom the ship and all the goods belonged. "Kannitverstan," answered the man.

"Ah," said our young friend, "no wonder Kannitverstan can build beautiful houses and have tulips in his windows."

Then retracing his steps he sadly reflected on his own condition. He felt bad to think that there should be such rich people in the world, and he so poor. Just as he was hoping that he too might sometime enjoy life as this unknown Kannitverstan evidently was doing, he turned a corner and came upon a funeral procession. The black hearse was drawn by four black horses, walking slowly and sadly as though they knew they were taking a person to his last resting place.

A long procession of friends and acquaintances followed the hearse on foot. In the distance a bell was tolling. A feeling of melancholy took possession of the traveler and he stood with uncovered head reverently watching the funeral procession move along.

When the last man was about to pass he ventured to take hold of his coat, and in a sorrowful tone said: "The man for whom the bell is tolling must have been a good friend of yours, for you are so sad and thoughtful." "Kannitverstan," was the answer.

Tears welled up in the eyes of the young journeyman, and his heart became heavy, and then light. "Poor Kannitverstan," he called out. "What good does all your wealth do you now? You have a shroud, and of all your beautiful flowers perhaps a rosemary on your cold breast."

With these thoughts he accompanied the mourners as though he were one of them. He saw the supposed "Kannitverstan" lowered into his last resting place, and was more deeply affected by the Dutch funeral sermon, not a word of which he could understand, than he had been by many a German one. And whenever he felt bad, thinking of his poverty, he consoled himself with the thought of poor "Kannitverstan" of Amsterdam, his beautiful home, his valuable ships and his narrow grave.

HERO TALES

The hero tale has an imaginative appeal as strong as that of the myth or fairy tale, but its greatest value lies in its inspirational quality. The lofty ideals, courage and spirituality of the ideal hero find probably their highest expression in the character of King Arthur. Those tales that are here included are representative of a very large number in literature that are accessible.

THE COMING OF ARTHUR*

One dark stormy night a long time ago, in a land beyond the seas, old King Uther lay upon his bed dying. He was weeping and lamenting, not so much because he was leaving this world, but because he had no son or daughter to come after him and rule England. There were two old men who stood near the King, whose names were Bleys and Merlin. When they saw that their King was silent in death, they passed out into the black night and walked down toward the ocean where the great waves came rolling in from the deep.

The night was stormy, and they noticed that the waves grew larger and larger. They counted them—one, two, three, up to the ninth—which seemed to gather half the sea. Suddenly, on the highest crest of this wave, they saw a shining ship in the shape of a dragon, and all from stem to stern the deck was covered with shining people. No sooner had they seen the ship than it disappeared. But nevertheless this great wave came rolling in and tumbled at their feet. Strange to say out of this wave there rolled a little naked child, and Merlin picked it up and cried, "The King! The King! an heir for Uther!" Then the long wave swept up the beach, wrapt about the old man and flashed like fire. After which there was a calm, and the stars came out, and the elves and fairies blew their horns from cliff to cliff.

Merlin gave the little child to an old woman to nurse. He was given the name of Arthur, and as the years passed by he grew into a beautiful boy with blue eyes and golden hair. Merlin, who was a very wise old man, became the boy's teacher.

But let me tell you a story about the boy. One day, as Arthur was walking out all alone in the sunny fields, he came upon a little girl sitting down upon a bank of heath, weeping as if her heart would break, and saying: "I hate this fair world and all that's in it." She had been beaten for a fault of which she was not guilty. When she looked up there stood the boy Arthur. Whether he could walk unseen like his old teacher Merlin who was something of a wizard, she did not know, but there he stood smiling at her. He dried her tears, comforted her heart, and was a child with her. But one day after that when she saw him again he was so dignified and cold she was afraid of him. But again when she saw him his ways were sweet and they played as children together. They were golden hours for her and for him. She said then, "Some day he will be King."

As Arthur grew into manhood he wanted a sword, as all boys did in those days. One summer day he was in his boat on the lake. All around him spread the shining water, above him bent the sky, soft and blue. He moved to the center of the little lake and stopped. It was noon, and he sat thinking. Perhaps he was wondering what he would do when he became a man. Suddenly he heard the water ripple, and near by he saw, rising from the lake, a white arm and hand holding a sword. Arthur reached out and took the sword and then the hand disappeared.

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* Published by permission. From *Some Great Stories and How to Tell Them*, by Richard Thomas Wyche, published by Newson & Company, New York.

The hilt of the sword was in the shape of a cross, studded with jewels that sparkled and flashed. He pulled it from the scabbard and the blade was so bright that it hurt his eye to look at it. On one side of the blade he saw cut in the steel in the oldest language of all the world, the words, "Take me," but on the other side, in the language of the people, "Cast me away." It made him sad to think he must cast it away. He took it to his old teacher Merlin, who was then a hundred winters old. Merlin said: "'Take me' means that you must take the sword, clear the forest, let in the light and make broad pathways for the hunter and the knight; break up the robber dens and bandit holds; drive back the heathen that come swarming over the seas, burning the houses and killing the people." Then he whispered into Arthur's ear and said: "Some day you may be King. After you have ruled the land and made it better, the time will come when you may cast the sword away, and that is a long way off."

The years passed. Not since that dark stormy night on which King Uther died had there been a strong ruler in England. The people fought among themselves. The heathen came swarming over the seas; the wild animals came from the woods and carried off the children. The land was going to ruin. One day the people came together and said: "We must make one man King." Whom do you supposed they crowned? Merlin, with his knowledge and power, had Arthur lifted up and put on the throne. Many people believed he was the rightful King, but others said: "Away with him, he is no King of ours, he is base-born." But then Arthur spoke to the people in the hall, and asked all of the young men who would help him rule the land to come forward. Many heard his manly voice and came and stood before him. He said to them: "Will you speak the truth; be pure; right the wrong; be strong yet gentle; be true in love; obey the King, and your conscience?" When they said "Yes," they kneeled before him, and he made them his knights. When they arose from the knighting, he spoke to them in a low deep voice of authority and told them that he wished to make a good King, and that he wanted them to rule the land and make the world better, and the people happier.

While he stood speaking to them, for a moment every man seemed to favor the King; their faces were radiant. Then suddenly three rays of light fell as if from heaven, and lit up the faces of three tall Queens, who stood near the throne to help the King at his need. Near him stood his old teacher Merlin, and the Lady of the Lake, who, it was said, made and gave him Excalibur, the wonderful sword. After that, other young men came and took vows of knighthood, until there were hundreds of knights. They were called Knights of the Round Table.

Then King Arthur went against the heathen, and in twelve great battles drove the last one from the country. One day, as he was passing with his army through the streets of a village, he saw, standing by a castle wall, a beautiful young woman. He did not know her, nor did she know him; for Arthur was clad simply as one of his knights, and not in his kingly robes. Arthur could not forget the face. He was in love with the young woman, and wanted to make her his wife and Queen. When he returned to his palace, he called Sir Bedivere and two other knights, and sent them to search for the young woman.

The young woman's name was Guinevere, called the pearl of beauty, and her father was an old King, Leodogran, King of Camelaird. When the knights stood before him, and said, "King Arthur wishes Guinevere to be his wife and Queen," the old man spoke roughly to them, and said, "Who is Arthur, that I should give my daughter in marriage to him? He is base-born, and not the son of a King. Even though he has helped me in battle, how can I, being a King, give my daughter in marriage to a man that is not a King, or the son of a King?" When Leodogran made further inquiries, and heard of Arthur's birth and boyhood, of the wonderful sword Excalibur,

of the three rays of light at his coronation, of his pure life and great deeds, he still doubted.

He sat upon his seat and actually nodded, napped and kept the knights waiting. But while he napped, he dreamed, and in his dream saw a great battle-field, starting at his feet and sloping away as far as the eye could reach. On this field armies were passing and moving. Arthur, the newly crowned King, with his army, was victorious and glorious. When Leodogran woke up, he called the knights and said: "Yes, Guinevere my daughter, may go."

Some time after that, King Arthur called Sir Launcelot, his best knight and warrior, and sent him to bring the Queen-to-be to his palace. Sir Launcelot and other knights with him rode away on horseback, while King Arthur stood and watched them from the gates as they disappeared. Guinevere was ready and came with Sir Launcelot. It was the first of May, when the earth was white with hyacinths. The woods were all abloom and seemed full of singing birds. Guinevere rode on horseback by Sir Launcelot. Each day couriers went before and pitched a tent where the Queen-to-be might rest at noon. The journey was soon at an end. Sir Launcelot had entertained Guinevere with talk of the journey, the chase, the hunt, and of King Arthur and his noble deeds. Sir Launcelot was so strong, yet so gentle and tender, that she could not help but like him, and love him. When King Arthur came out to meet her, clad in his knightly robes, he seemed so tall and dignified that she felt a little afraid of him. But she knew that she was to be his wife and Queen. Straightway they went to the church, and there before the highest of altar shrines, the bishop made them man and wife, and blessed them. Then as they went from the church, King Arthur's knights, clad in stainless white, marched before him with trumpets and a song:

"Blow trumpet, for the world is white with May!
Blow trumpet, the long night hath rolled away!
Blow thro' the living world, 'Let the King reign!'"

And that was the coming of Arthur.

THE PASSING OF KING ARTHUR*

After King Arthur had ruled a long time and made the land better, the heathen came again over the seas to take the land. Some of his own knights proved untrue and joined with the heathen and fought against the King. King Arthur gathered together his true knights and went against the heathen and traitors, driving them back, league by league, until they came to the sea and there they could go no farther. They camped and got ready to fight, and it was King Arthur's last battle. A sad time it was for King Arthur. Sir Launcelot had forsaken him, and Guinevere, his Queen, had become wicked and worldly, until the people talked about her so much that she fled to Almesbury, there to live with the nuns.

On the night before the battle, Sir Bedivere passed by the tent, heard the voice of Arthur, and as he listened for a moment, heard him moaning and saying:

"I found Him in the shining of the stars,
I mark'd Him in the flowering of His fields,
But in His ways with men I find Him not"

***Toward the close of his prayer, he heard him say: "My God, thou hast forgotten me in my death; nay, I pass, but shall not die." It was a cold dreary day, the last day of the year. And the two armies met on the sea beach. Face to face they fought with battle-ax, sword, shield and spear. While they were fighting a dense mist came up from the sea and rested on the battle-field, so that all was in confusion; enemy slew enemy and friend slew friend.

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All day long the noise of battle was heard; the crashing of battle-axes, the clashing of swords, the groans and cries of the wounded and dying, until at twilight nearly every man had fallen in death, and no sound was heard save the seething of the sea. From the north came a cold wind that blew the mist aside and with the wind came the tide. King Arthur looked across the field, but saw no man moving there. The tide had come up from the sea and hollow helmets and shattered brands and dead men were washed about in the waves.

King Arthur saw Sir Bedivere, the last left of all his knights, and said: "Hearest thou the great voice that shakes the world? Oh Bedivere, on my heart has fallen confusion and I seem but a King among the dead." Then bold Sir Bedivere replied: "Yes, King, my King everywhere, King even of the dead." And seeing that King Arthur was wounded he bore him to an old chapel near the field that stood on a strait of barren land. On one side lay the ocean, and on one lay a great water, and the moon was full.

Then spake King Arthur to Sir Bedivere, and said: "I am sore wounded, and without help cannot live until morning. Take the sword Excalibur. You remember how one summer noon a white arm rose up from the bosom of the lake holding the sword; how I took it and have worn it like a King. But now take the sword and cast it back in the mere, then come and tell me what you saw and heard." Then Sir Bedivere passed from the chapel down over the jutting rocks until he came to the shining levels of the lake. As he looked at the jewel-handled sword and saw the sparkling diamonds, it seemed wrong to throw such a wonderful sword away. So he stuck it in the mud and walked slowly back to the King. Then King Arthur said: "Tell me what you saw and heard." Sir Bedivere said: "I heard the ripple washing in the reeds, and the wild water lapping on the crag."

Then said the King: "You have disobeyed me. You would have seen a sign, a hand, or a moving of the mere. Go, obey me, come back and tell me what you saw and heard." Then the second time Sir Bedivere came to the water's edge. But when he looked again at the wonderful sword and saw how curiously it was made, he said aloud to himself: "If I cast it away a precious thing will be lost. I would obey the King, but he is sick and out of his head, and knows not what he is doing. It would be far better to save the sword and when the King is gone it will hang in the hall and speak for him, his pure life and deeds." And so the second time he hid Excalibur and went slowly back to the wounded King. King Arthur was breathing heavily, and said: "Tell me what you saw and heard." Sir Bedivere said: "I heard the lone wave washing in the reeds and the water lapping on the crag."

Then King Arthur raised himself, and said: "Ah, miserable, unknightly, traitor-hearted. Obey me, or I will slay thee with my hands." Then Sir Bedivere ran quickly, seized the sword and threw it with all his might. The sword whirled over and over, flashed in the moonlight and fell like a falling star. Just before it struck the water an arm clothed in white samite, wonderful, seized the sword, brandished it three times and drew it under the water. Sir Bedivere ran back to the King, and Arthur said: "Ah, I see by your eyes you have obeyed me." Sir Bedivere told him what he had seen.

Then King Arthur, breathing hard, said: "My end draws nigh. I must go. Take me to the sea. I fear my wound hath taken cold and I shall die." Then Sir Bedivere lifted him tenderly, the man above all men he loved and worshiped, and bore him down to the water's edge. Into Sir Bedivere's ear King Arthur said: "Quick, quick, I fear it is too late and I shall die."

When they came in sight of the lake, there they saw a black barge and as they drew nearer all the deck seemed full of people in long black robes. Among them were three tall Queens with crowns of gold, beautiful, like fairy Queens, and they were weeping. King Arthur said:

"Place me in the barge." The Queens put forth their hands and took him. The tallest laid his head in her lap, removed the casque, chafed his hands, and weeping, dropped bitter tears upon his brow. Then Sir Bedivere said: "Oh me, my King, what must I do, you're going, the knights are dead and I alone am left." Slowly from the barge the King replied: "I am going a long way to the Island-valley of Avilion, a place beside a summer sea to heal me of my grievous wound. If you never see my face again, pray for my soul, for more things are wrought by prayer than this world dreams of."

Then, like some full-plumed swan, the boat moved away from the shore and turned to the open sea. As it went out over the sea, lo! the light from the sun about to rise lit up the sky and water, and as the boat grew smaller and smaller in the distance, Sir Bedivere climbed higher and stood shading his eyes with his hand, gazing upon the boat until like a little speck it was lost in the light of the rising sun. As he stood there in the stillness of the winter's morning, it seemed to him he heard, as it were, from beyond the limits of the world, a great shout like an army returning from battle victorious around their King. Then as he turned and went away he groaned and said to himself: "The King has gone." Then came to his mind the weird rhyme of Merlin:

"From the great deep to the great deep he goes."

Many said that King Arthur would come again. He never did as they expected him, but he is with us to-day in song and story and art to make us stronger, purer and more spiritual.

THE STORY OF WILLIAM TELL

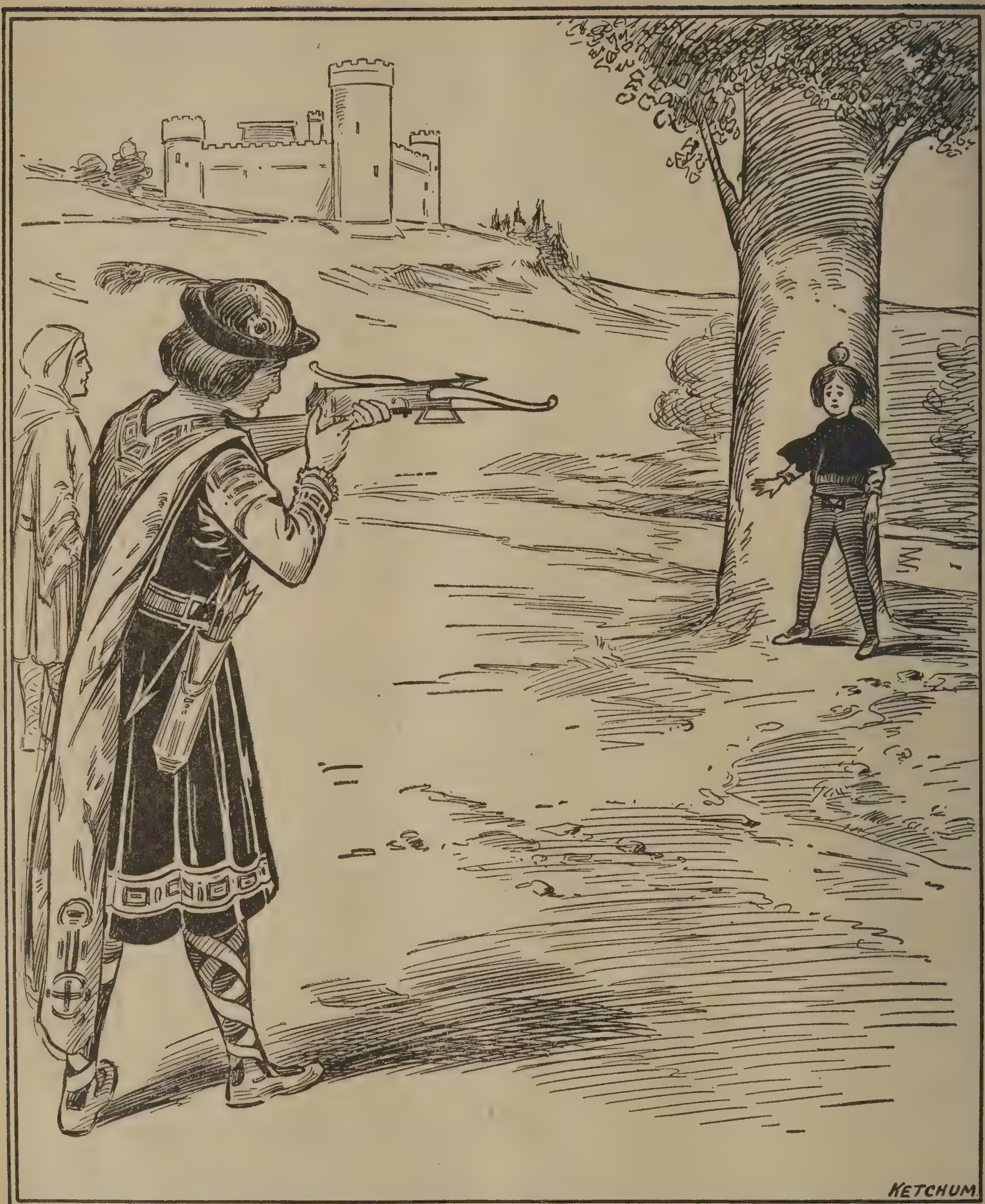
Many centuries ago there lived in Switzerland a brave peasant named William Tell. At this time Switzerland was ruled by strangers from across the mountains, who had sent as governor a cruel tyrant named Gessler. Not only did he fill the land with great fortresses to awe the people, but he made them submit to him personally. In the market-place of Altorf, where the peasants came to sell their grain, butter and cheese, and to buy their simple necessities, he set up a pole on which he placed his hat as a symbol of his power. Then he commanded that every Swiss man, woman and child who passed by the pole should bow to the hat to show their respect for him. Among those who were especially indignant at this sign of despotism was the brave William Tell, and he joined with thirty-three of his countrymen to free the land from foreign rule.

One day a fair was held at Altorf. Tell arose early that morning in his little mountain home and made his way to the fair to sell his chamois-skins and to buy something for his wife and children. Accompanied by his little son, he crossed the market-place and stood directly opposite the spot where the pole had been erected. Tall and proud, he stood there, refusing to bow to the hat, though the soldiers stationed there by Gessler reminded him of the punishment that befell those who would not bend the head.

As soon as the tyrant Gessler was told of the peasant's defiance, he commanded that Tell be brought before him. The Swiss soon appeared, leading his little son by the hand.

"You are a skillful archer," said the tyrant; "I am told that you handle the bow and arrow the best of anyone in the country. I am desirous, however, of proving your skill, and also of giving you a chance to save your life. Let your boy stand a hundred paces distant, and then place an apple on his head. If you shoot an arrow so truly as to cut the apple in two, your life will be spared. But if you slay the child or miss the apple, you will die at once."

"Merciless despot," cried the agonized father, drawing *two* arrows from his



WILLIAM TELL

quiver, "do you think for one minute that I would save my own life at the expense of my child's? Let me die, then. I will not shoot the arrow."

"Then, traitor, your child shall be slain before your eyes," came the stern reply.

In despair, Tell signified his willingness to make the test, while the servants

of Gessler led the lad away a hundred paces, and placed an apple on his head. The boy stood with his back to his father.

The people crowded about, pale and frightened, not daring to show their sympathy for the helpless father. Then was heard his ringing voice: "Turn your face toward me, my son!"

The little fellow faced his father without a moment's hesitation, and stood perfectly still, with head erect. As the father brought the bow-string into place he shut his eyes.

With a prayer on his lips William Tell let fly the arrow, and almost as soon as the sharp twang of the bow-string was heard, a great shout arose from the crowd:

"The apple is cut in two! The boy's life is saved!"

Tell, pale and trembling from the terrible strain, was about to clasp his son in his arms, when the tyrant stopped him.

"Tell me," he said, "why did you place two arrows in your belt?"

"The second arrow would have found your heart, tyrant, had my first shot gone astray."

"Ah, I like your frankness," sneered Gessler. "Also, I shall show you how a tyrant can keep his word. Your life is spared, as I promised, but your body shall be placed in a dungeon into which neither sun nor moon can shine. We shall see then whether your skill as an archer will avail you anything."

Then he commanded the soldiers to seize the peasant, place him on a small vessel and take him to the sunless dungeon.

The bow and quiver were placed out of reach at the feet of the pilot, and Tell was put into chains. The vessel had hardly started when a fierce storm arose, and the cruel Gessler became very much frightened. Thereupon one of his men told him of the great skill that Tell had in managing a boat. Gessler, his fears overcoming all other considerations, ordered that his prisoner be unbound and placed at the helm, and the sure hand of the Swiss was soon guiding the boat safely through the storm.

Just as the vessel was turned toward the land, Tell noticed a high rock, and called to the rowers to row with all their might till they should have passed the danger point. When this point was reached the archer snatched his bow, forgotten during the storm, sprang on shore and was soon out of sight in the mountain forests.

Gessler and his men disembarked safely, and started for the tyrant's castle. Tell had hidden himself in a thicket on the road leading to the castle, and when the party came by a swift and sure arrow shot from the bow of the peasant-archer pierced the heart of the despot.

As Gessler fell from his horse a voice rang out: "My brave uncle, your shot was well aimed indeed! We are now free!" Tell turned to meet his young nephew, who had come to tell him that his countrymen were waiting for him if he could make his escape.

That night the uncle and nephew joined the little band of patriots in the town, and in a few days the whole country was in arms against the foreign oppressors. The enemy was soon driven out, and Switzerland was free. Of all the brave defenders of their country there was none more happy than William Tell, the hero-archer of the Swiss mountains.

HOW THE WINDS WERE BORN AND SET TO WORK

Years and years ago before men had come to live on the earth, and Mother Nature was busy in simply finishing up odds and ends of business, the kingdom of Air alone of the four great kingdoms of nature, being naturally a very active kingdom, always ready to move, felt that he did not have enough important work to do. All the other kingdoms were busy. Earth was building mountains; Water was shaping the land, spreading out material into plains and helping to make things grow; Fire was busy in the center of the earth melting up rocks and pouring them out from volcanoes, and for that matter was busy in burning up useless material; being rather quarrelsome, he had trouble most of the time with Water. The other kingdoms did say that Fire was all right unless he tried to be the boss.

But Air thought that such an active fellow as he, ought to have some real important work to do. So he looked up Mother Nature and told her that he wanted something to do to help her—something important this time.

"Bless me," exclaimed Mother Nature. "Don't you know that not a single one of the animals and plants that Earth is so proud of could possibly live without you, and then—why, what would the birds do if they did not have you in which to fly?"

"That is just it," sighed Air. "You see that is no work. I just *am,* and what you say happens because you made it a law, but I want something to do."

"Very nice of you, too," answered Mother Nature. "Well, let me see. We want all the kingdoms to be satisfied in this matter, because you know if I make it a law it cannot be repealed. Let us go and see what the others say."

So Air and Mother Nature went to call on Earth.

"Earth," said Mother Nature, "Air is very sad. He has decided he wants to serve, too. What will you do for him?"

Earth was very busy growing a new plant just then, but he stopped long enough to answer Mother Nature.

"If he will get himself some sons, and teach them to blow my seeds over the land, cool my heated places with plenty of rain and warm my cool ones by carrying heat, I will do anything in the world for him."

"Very well!" said Mother Nature.

Then off they flew to visit Old Ocean.

"Old Ocean," said Mother Nature, "Air is very sad. He has decided he wants to serve, too. What will you do for him?"

Old Ocean was engaged in showing some very new whales how to swim, but he stopped after a while and answered Mother Nature.

"If he will get himself some sons and teach them to blow my topmost water into big waves, that the fish may have sport, and help me crush the rocks to sand and wash the beach, I will do anything in the world for him."

"Very well, indeed," said Mother Nature.

Then off they flew to visit Fire.

"Fire," said Mother Nature, "Air is very sad. He has decided that he wants to serve, too. What will you do for him?"

Fire was working hard at throwing the top of a new mountain and pouring hot mud and ashes down its sides, but he stopped when he heard Mother Nature speak.

"If he will get himself some sons and carry my smoke away, fan my blazes and make me burn fast and far, I will tell my son, Heat, to do anything in the world for him."

"That is very, very good," said Mother Nature to Air. "What you want is some sons."

"But how am I going to get them?" inquired Air, bewildered.

"Leave that to me," said Mother Nature.

Now Air knew that was the best to do at all times. So he went home and

rested content. He felt something was going to happen. Sure enough the very next day a fine, strongly built boy walking past, stopped, took a good look and then said, "Why—er—yes, hello, father!"

"And you — you —" began Air, hardly knowing what to say.

"Oh, that is all right," continued the new comer, cheerfully. "Mother Nature said I was to be your oldest son. I am the North Wind."

"I am sure we will get along all right," said Air, "and I am glad Mother Nature sent me such a strong son, but how are you going to help me?"

"Why this way; you see up north you will load down with cold, then I am going to bring you down here where it is warm. And I will bring health and good bracing weather. And snow in its time. Many birds will fly with me, but the Sea Gull and Stormy Petrel are my favorites. Don't forget I am the North Wind."

"Very good, there will be plenty of work, and now—well, who is this?"

The new arrival did not have as much bluster about him, but he spoke up quite briskly.

"If not mistaken you are my father. Mother Nature said I was to tell you that I was your second son. I am called East Wind. I see my elder brother is here. Well, do you want me to get to work?"

"I must say," ejaculated Air, "Mother Nature means business. I am proud of two such strapping big sons but what do you do?"

"As I understand it," said East Wind, thoughtfully, "out on the ocean you take on a lot of water. It is my business to move you in over the land. In this way I am to bring water and help things grow.

"Just wait a moment," said a cheerful voice. "I belong to this happy family, too. Mother Nature just woke me up and said I would find my father here, and I am to say that I am your third son. I am the West Wind."

Both the North Wind and the East Wind looked a little jealous of the new comer. He had a frank, open countenance. You couldn't help liking him.

"I am most fortunate," began Air. "I expected Mother Nature to help me out, but really did not hope for three such nice sons. I am fond of you all, but just what do you do?"

"Well, according to Mother Nature, I am the fellow to straighten things up after my energetic brothers here get them mixed. It never will do to have too much cold and rain, so I am to blow the clouds away, so that you, father, can get down to regular business again. Mother Nature has made me good and strong, too."

"Pooh!" exclaimed North Wind. "If it comes to strength I—"

"Yes," put in East Wind, "we don't need to ask you when we must go. I have a good notion to—"

"No fighting here, boys," said a sweet voice. "I am your daughter, sir (talking to Air), sister to these boys. I am the South Wind. Mother Nature said you wanted sons, but she thought you needed a daughter, if for no other purpose than to teach these boys manners."

Air was delighted. "And a daughter, too! Mother Nature is just the dearest mother; but I say, do you have any regular work to do?"

"Yes, indeed, father, dear. I am to bring you up from the south when brother North Wind forgets himself. I bring the birds and flowers. The boys may help you do your hard work. I am going to keep your home in order, see that things are all right, ripen fruit and all useful grain. I am going to make you all love me."

And this is how the winds were born.

THE BLANKET MOTHER NATURE MADE

Air of course was delighted with his interesting sons and their lovable sister. But things never are quite right, and in spite of the gentle manners of South Wind, the three brothers did not get along well together. The trouble was North Wind wanted to boss all the time. East and West Winds were more reasonable, but North Wind would bluster in every chance he got. So Air had to call in Mother Nature. They couldn't all blow together, for then you had a whirlwind which tears up trees and plants.

"I must say, Air," began Mother Nature, sternly, "you are not a great success as a father. Why not exercise your authority?"

"Why, you know you sent them to me full grown and gave each one his work. I didn't know you meant for me to arrange details!"

"Most certainly! You are a kingdom, you know. Now you divide the year among your sons. But see here," she added, thoughtfully, "it won't do to give them too exclusive control. I suppose North Wind is the most blustry of all?"

"Yes, indeed," sighed Air. "The others are more reasonable. And dear little South Wind, she will do anything we ask."

"Well, it is up to you. You had better go around and talk with Earth about it, because you know Earth will want to look out for the best interests of his plants and animals, but you make some sort of an equitable division of time. We can't have this fighting."

So Air went and called on his brother kingdom, Earth, and asked his advice.

"Dear me, brother Air," exclaimed Earth, "we no sooner supply you with sons and a daughter than they disagree among themselves. But it is very nice of you to come and consult with me. Now let me see. From what you say, North Wind is the one most to blame. Well, how would it do to give him—well, say about three months of the year as his special time. Let him blow, but you see my animals and plants will just have to have regular supplies of water and sunshine and the other winds—"

"I believe I can arrange with them," continued Air. "East and West Wind are reasonable, and as for dear little South Wind, bless her heart, she will do anything we want."

So Air called a family council. His three quarreling sons were standing before him while little South Wind had a stool right at his feet.

"Sons," began Air, "I am very much disappointed. I might as well have no sons at all. Instead of a help you will drive me crazy by your inconsiderate actions."

"I am only doing what Mother Nature fitted me for," blustered North Wind. "She made me strong. What am I for?"

"Son, son," expostulated Air, "it is rude to break in that way, but that is like you! Now I have been considering this matter and have adopted a schedule, some general rules for you to observe. North Wind is so made that I think it best to give him a part of the year in which to do whatever he wants, and so I have selected the three winter months—"

"Too short!" snorted North Wind.

"— for him," continued Air, not noticing the interruption. "That is the rest time of Mother Nature anyway. During these months he can do as he wishes. I don't suppose he will want to blow all the time even then, but whenever he feels like working, let him alone. But for the rest of the year—"

He paused reflectively. In the meanwhile, West and East Wind had been talking together and West Wind, in his usual open manner, spoke up.

"I think, sir, if you will let us alone, understanding that North Wind has no particular business the rest of the year, I and my brother East Wind can agree. We will sort of take turns, so as to keep things even. But I say, I will have to have a little more of the time, for it is up to me to blow away North Wind if

he gets too busy when we are the ones to rule—we—"

"I just think you boys are selfish!" spoke up South Wind. "And I am sure father will see that I have some work also."

"I was going to suggest," laughed West Wind, throwing a kiss to his sister, "that we would all of us be glad to give our little sister a chance now and then, and in the summer when Earth is so anxious about his plants, really she ought to have considerable to do."

Air was delighted to have his plans so ably seconded by his favorite son. Though North Wind blustered considerably about what he called the unfair division, still Mother Nature gave her approval to the arrangement. But just to show you how much trouble one inconsiderate son can make in a family, we will tell you what happened the very first winter. You see, North Wind, just as quick as his time came, went to work with such savage energy, blew so constantly and hard, wouldn't let little South Wind blow except at rare intervals, that when spring came a great many plants had been killed, also some animals, the rest had suffered, and there was a general complaint. Mother Nature said that she would have to make some kind of a blanket for them; for while she would keep her word and let North Wind blow during the winter, she really could not consent to have so much injury to the plants and animals. But the shrewd old mother kept things to herself. You may have observed that Mother Nature does not go around talking of her plans, she just does things and we have to study them out. Well, time passed, and winter came again. And North Wind started in more vigorously than ever.

One morning, something very strange began to happen. Air was full of tiny white things—little white flakes that came fluttering down to the ground—tiny little bits of no-one-knew-what.

"Curious kind of white bugs," remarked Grass.

"Wonder if it's a new kind of bird?" said Oak Tree. "Seems to be a huge lot of 'em."

"Aren't they pretty?" rustled Rose Bush. "They look like tiny white rose buds falling on my branches."

"Hey, Mother Nature," called Oak Tree, "please tell me what all this white stuff on me is—I never saw it before."

And Mother Nature, hurrying through the woods, a broad smile on her sweet old face, stopped and laughed at Oak Tree.

"Can't you guess, Oh, Oak Tree?" she cried happily.

"No, I cannot guess," answered Grass and Oak Tree.

"It is your new blanket that I promised you. I have studied over this blanket considerably. I think it just the thing. Now you all snuggle up under your blanket and let North Wind blow all he wants to. When spring gets along, South Wind will pull your blanket off and wake you up, and you will be ready for a new year's work."

And this is how the snow blanket came to be made.

THE ANIMAL THAT CONQUERED THE KINGDOMS

Way back in the beginning of things the four kingdoms, Earth, Air, Fire and Water, were in final consultation with Mother Nature as to what each was to do. Mother Nature told them she had made a number of laws that all would have to obey, but aside from that she expected the four to take charge of whatever there was to do in a general way, and not leave her to attend to all the little details as she had been doing. There had been a great deal of objection to making Fire a kingdom at all, and he was finally admitted for the sake of peace. Fire and Water were quarreling most of the time and Fire was always causing trouble for Air and Earth. So Fire, pushing himself forward as usual,

had suggested to the other kingdoms that they might just as well have an understanding with Mother Nature first as last as to whether they should have absolute control in their own department or whether they were to be conquered by some other force. Fire was the spokesman.

"Mother Nature," he began, "if we are to be kingdoms and relieve you of a great deal of work, we want to know whether we will have to obey any other power except your general laws, er—"

Air noticed that Fire was becoming somewhat heated and so he broke in. "You see it is this way. I—to take my own case—see that I am to have a great deal to do, moving things around, bringing storms and sunshine not to mention the different work at different seasons of the year; besides, I have to keep all things alive. Well I am willing to do all this, but I want to know whether you are ever going to put a master over me, one that will make me work for him, and that is what we all want to know."

All nodded approval though Fire glowed with repressed emotion at Air! Air had interrupted his talk.

Now Mother Nature is a remarkably wise mother and she knew that it was not best to explain all her purposes to the kingdoms she was putting to work; she always carries out her plans, but believes in avoiding all unnecessary trouble; as she expresses it, she "works along the lines of least resistance." So she simply smiled and remarked in a soothing way, "My dear kingdoms, you are borrowing a lot of trouble. Never cross a bridge until you come to it. You will each of you be supreme in your own department, simply subject to my general laws, until man comes—"

"Man!" ejaculated the kingdoms. "What is he?"

"He will be fashioned like a rather small two legged animal," replied Mother Nature, affecting a yawn as if not greatly interested.

"Animal," sniffed Earth, "huh, I suppose he will be a good many times stronger than an elephant?"

"Dear me, no," replied Mother Nature. "Nothing of the kind. He will not be noted at all for his strength."

"Small and not strong. Pooh, I don't care for him!" and Earth seemed content.

"Will he swim around in me like a fish?" demanded Water.

"No, indeed," drawled Mother Nature, "he will have neither fins nor gills."

"Well, he never can boss me!" murmered Water.

"Will he fly like birds?" put in Air.

"Not at all, he will have neither wings nor feathers."

"I say," began Fire, warming up, "will he be such that I can't burn him?"

"No, no," answered Mother Nature. "He won't burn like wood, but just as any animal."

And the four kingdoms simply looked at each other and smiled knowingly. Such an animal as that described could never conquer such great and strong kingdoms as they. Mother Nature must be playing a little joke on them. So they agreed to the terms, and things just started going. Earth grew flowers and pastured animals. Water commenced to grind rock into sand and to cut and carve the land surface. Air began its work, while Fire, as usual, did a great deal of useful work, but kept on trying to boss all things.

And one day man came. The kingdoms looked him over.

"Nothing doing!" snapped Fire.

All the other kingdoms just laughed and poked each other in the ribs. "Ha, ha, Mother Nature, that two legged animal! Conquer us? Well I guess not! Ha, ha, ha."

Mother Nature, who was standing by, simply smiled. You know she never does explain things. If the kingdoms had not been so busy attending to what they thought were important matters and so were letting man pass unnoticed, they would have seen that Mother Nature made it her business to give all sorts of hints to the new animal, and in some way he seemed to improve on the hints. When Fire burned a tree down, men came and warmed their hands, then they looked

at the fire and talked with each other, and carried pieces of wood into caves and some of the sticks were on fire. This was only one way in which, by such slow degrees that Fire did not notice it, he began to serve man. Just so with Earth. Earth had some grain and fruits growing in the fields and woods, and man enjoyed them, and then, first thing Earth knew, man had deliberately cleared off part of her surface and was sowing and planting things, and worse than all this man was digging into Earth and taking out coal and oil and stone.

Both Water and Air resisted more strongly. Water drowned the men, and Air blew their ships on rocks and blew things around so hard that the ships were wrecked. But one day Water was startled to notice what he thought was a great fish swimming along near the top of the water. But it was not a fish. He heard the men calling it a sub-marine. So Water was conquered.

But Air remained. "He can't get at me," he exulted. "I send big winds and blow his flowers and trees down, and sweep in such immense storms that his country is ruined. I am very sorry for the other kingdoms, but you see I am stronger than any of the rest of them—I —I—I—My stars, what sort of a bird is that?"

"Ho! Ho! Ha! Ha!" laughed the other kingdoms. "Can't conquer you, eh? Stronger than the rest of us are you! Well, that is no bird, that is a flying machine. It looks as if man was going to whip you more than us."

"Let us go and have a talk with Mother Nature," crackled Fire. "Maybe she can help us make a better fight."

"You didn't ask me about brains," said Mother Nature kindly. "I told you how he was to be, but thought I would let you find out about brains. That is what makes the difference. That is why he has conquered you all. But children, even I did not quite understand what I was doing when I gave him brains. The fact is he is even presuming to investigate my laws and he is daring enough to apply them in ways I never thought he would. There is over and above all you kingdoms —even above me—a mighty kingdom of Ether, it is a riddle even to me, man is actually presuming to investigate it and setting all sorts of powers that come out of it to work. Ah—me—in some ways this last child of mine, man, is actually above his mother. But children, the mightiest power in the Universe, the Power of Everlasting Love and Intelligence is directing all things, we may be sure of that, and so we must all be content."

ONLY A LEAF

It was only a little leaf;
But on it did shine the sun,
The winds did caress, the birds did sing,
And it lived till its work was done.

It was only a little leaf;
But it took its gladsome part
In the great earth's life; and at last
Earth clasped it to her heart.

MYTHOLOGY

You have at times noticed the sun when near setting shining through the clouds, causing an appearance not unlike great ropes hanging down from the sun. You know the explanation; but perhaps you have heard people not so well informed, insist that the sun is drawing water. If you were to visit some of the islands of the Pacific, the people would inform you that what you see are ropes by which a great hero had caught and tied the sun so that he has to make a regular round every day. They know they are right, because you can see the ropes for yourself. These primitive people are doing just what civilized men are—explaining as best they can phenomena they see around them.

A Mythological Story

Of course, the hero is given a name. He is Maui, and this is only one of the many great things he is said to do. That story is a myth found in modified forms among many people. Some of our Indians made additions to it. The moles took pity on the poor sun and burrowed through the ground to the place where he was tied at night to gnaw the ropes and set him free. But—sad to say—the heat and light were so great that they burned their eyes and since then moles have been blind.

Development

In a similar way stories arose among all people, including the primitive people of Europe that afterwards became the Greeks, Romans, and various people in Northern Europe. But we can see at once that though the primitive stories were crude, the tendency would be to refine away the crudeness, and that most of the detail would be quietly dropped as the people became more enlightened, yet references to them would remain. We can therefore understand references in the literature of European people to stories that in their origin were as crude as the stories of Maui and the

Sun. When history dawns the stories had long been cast into more refined forms, the original forms forgotten, but mythic incidents colored the literature and thought of the day. An elaborate system of nature and religious stories still survived, believed in by only the uneducated masses, secretly despised by the learned, but retained as the national religion.

The Story of Persephone

Let us illustrate by the story of Persephone. We conclude the original story was a very crude explanation of the changing year. The winter months, when vegetation ceases—the fruitful summer, and declining fall—it had grown into a more pleasing story as follows:

Jupiter and Demeter (god and goddess) had a daughter, Persephone, so beautiful that her mother hid her in a house, built for that purpose by the Cyclop (giants). But Pluto (god of the underworld) caught sight of Persephone, fell in love with her and wanted her for his wife. Jupiter agreed to help Pluto realize his wish, and instructed Venus, Diana, and Pallas—(goddesses) to persuade Persephone to go walking with them, while her mother was away, though she had been warned not to leave the house. But Persephone could not resist the appeals of her companions and ventured forth with them to gather flowers. This was Pluto's chance; he suddenly appeared and bore her away in his golden chariot to the underground world. Helios (the sun, who sees all things) informed her frantic mother of her daughter's fate and she, in turn, told Jupiter that either her daughter would be returned to her or she would quit Mt. Olympus, their home.

This brought Jupiter to his senses, and he sent an imperative command by Hermes (his messenger) to Pluto to release Persephone. As Jupiter was King, Pluto had to obey, but he gave Persephone a magic fruit to eat, which so affected her that for one-third of each year she returned to him.

This was the refined story, perhaps faintly believed in by the masses, but reverenced as a part of their religion. But the philosophical Greeks explained it in a figurative way and extracted from it a moral that is applicable today. Jupiter and Demeter represent heaven and earth, spirit and matter; Persephone, their daughter, is the human soul; Pluto, the god of the underground world, is the human body. The attendants that enticed Persephone are all symbolical, Venus is love, Diana is life, Minerva is wisdom or mind. They entice the soul from its heavenly abode to its residence in the body. We are here presented with speculations that still are to be found in religious thought of today.

The Origin of Mythic Stories

A myth, then, began as a crude story current among partially developed people to explain what they saw around them. They were theories of early times. Civilized men theorize today, but we have long since learned of the reign of impersonal law. We explain in terms of matter and energy. Present theories are reasonable, because in agreement with present knowledge; they may not be reasonable to men of one hundred years hence.

Final Stages Among European People

The more enlightened Greeks and Romans retained the core of the stories, so to speak, for a long time, but they made them serve to convey a moral truth, though the story itself was so changed that we can hardly recognize it. The northern tribes of Europe did not reach a very advanced stage of enlightenment and so Norse Mythology is comparatively crude and reflects the rough warrior life of the times.

We need not suppose that such stories were intended to convey a moral. The moral was read into the story by later collectors. The so-called Sacred Books of partially civilized people contain collections of such stories with their crudely expressed morals.

MYTHICAL STORIES.

Mythology generally refers to a mass of stories found in Grecian writings and in the writings of ancient Norsemen. The priesthood gave them a religious turn. The uneducated reverenced them. Poets and historians used them to embellish their writings. Finally collections were made exactly as we collect fairy and hero stories. It is well to have an outline acquaintance with such collections for present day literature contains frequent allusions to them. The following are a few of the ancient stories.

BAUCIS AND PHILEMON

Jupiter, the supreme ruler of the universe and wisest and most glorious of the gods of Olympus, was accustomed to visit the lands of mortals in human form. Once upon a time he passed through the land of Phrygia with Mercury as a companion, both disguised as mortals. When night came they were weary and hungry, and so sought rest and food. Though they knocked at many a door, the inhospitable dwellers would not rouse themselves to welcome the wayfarers.

Finally they reached a humble little cottage, where lived Baucis, a pious old dame, and her aged husband, Philemon. Here the gods found a kindly welcome and an invitation to enter. Philemon begged them to be seated, while Baucis raked out the coals from the ashes, kindled a fire and prepared some pot-herbs and bacon for them. Then she set the table, placing also before the grateful wanderers Minerva's olives, some cornel berries preserved in vinegar, radishes, cheese, and eggs cooked in ashes. Wine, apples and wild honey completed the meal, which was eaten with much pleasure, in spite of the earthen dishes and wooden cups.

Now as the repast proceeded, a wonderful thing happened, for as often as the wine was poured from the earthenware pitcher, just so often was it renewed. Baucis and Philemon then perceived that they were entertaining gods, not men, and, overcome with terror, they fell on their knees, imploring forgiveness for their poor entertainment. They begged permission to offer up as a sacrifice their old goose, the guardian of their humble cottage, but the fowl eluded them and took shelter between the gods themselves.

Then said Jupiter, "Be not afraid, nor let the goose be slain. We are gods, and you alone in the village have given us food and shelter. For their inhospitality the rest of the village shall be punished, but you shall not be harmed. Come with us to the top of yonder hill."

As they proceeded to the hill they saw the country behind them sink into a lake, with only their little hut left standing. Then they beheld a wonderful transformation: the cornerposts became columns; a gilded roof took the place of the thatch; marble floors, and doors enriched with carving and ornaments, appeared.

"Excellent old man, and woman worthy of such a husband," said Jupiter in kindly accents, "what favor would you ask of us?" Philemon then took counsel with Baucis, and in a few moments the aged couple told the gods their one wish:

"Grant us, we pray, that we may be priests and guardians of this, thy temple, and that one and the same hour may take us both from life."

Years passed by, and, as they stood one day before the steps of the sacred edifice, Baucis saw Philemon begin to put forth leaves, and Philemon beheld a like transformation in Baucis. As they spoke a few parting words, a leafy crown grew over their heads, and the bark closed their mouths. And in that land they may be seen to this day, an oak and a linden, standing side by side.

THE STORY OF NIOBE

Niobe, daughter of the King of Phrygia, and wife of Amphion, King of Thebes, was wont to boast of her birth, her marriage and her power, but most of all of her fourteen beautiful children, seven sons and seven daughters.

One day, on the occasion of a celebration in honor of Latona and her two children—Apollo and Diana—Niobe appeared among the people, and, surveying them with scorn and anger, cried out:

"What folly to prefer beings whom you have never seen to those who stand before your eyes! Will you prefer this Latona to me, she who has only two children, while I have seven times as many? Should I lose half my children I would still be more fortunate than Latona, with her two. Take the laurel from your brows; have done with this worship!" So the people left the sacred services uncompleted.

On the Cynthian mountain top, where she dwelt, the insulted Latona poured out her indignation to her son and daughter:

"My children, I who have been so proud of you both, and have been used to hold myself second to none of the goddesses except Juno alone, begin to doubt whether I am indeed a goddess. Unless you protect me I shall be deprived of my worship altogether."

As she was proceeding in this strain Apollo interrupted her: "Say no more," he said, "for speech only puts off punishment." So also spoke Diana.

Darting through the air and veiled in clouds, they alighted on the towers of the city, before the gates of which the youth of the city pursued their warlike sports. The sons of Niobe, some on spirited horses, and some driving gay chariots, were mingling with the rest. Ismenos, the eldest born, guiding his foaming steeds, was struck dead by an arrow from above.

Another was overtaken by an arrow as he was attempting flight. A third arrow pierced two who stood wrestling, breast to breast. Alphenor, who was hastening to their assistance, was slain in the act of brotherly love. "Spare me, ye gods!" the last one cried, but the arrow had already left the string, and it was too late.

The indignation and amazement of Niobe, when she learned what had happened, cannot be described, while Amphion, her husband, could not sustain the blow, and destroyed himself. The mother, kneeling over the lifeless bodies, kissed them and then raised her pallid arms to heaven.

"Cruel Latona," she cried, "satiate thy hard heart, while I follow to the grave my seven sons. Yet, bereaved as I am, I am still richer than thee."

At these impious words, the bow sounded, and all who heard were struck with terror except Niobe. Excess of grief seemed to make her brave. Her daughters, standing in mourning garments over the biers of their brothers, were struck by arrows, and fell, one by one, over the bodies they were lamenting.

When only one remained, the mother clasped this child in her arms, covering her, as it were, with her whole body. Even as she cried out, "Spare me one, and that the youngest! O spare me one of so many!" the child fell dead.

Desolate, and torpid with grief, Niobe sat among her sons, daughters and husband. Not a hair stirred in the breeze; no color showed in her cheek; her eyes were fixed and immovable; she seemed lifeless, changed to stone, within and without. Yet her tears continued to flow, and, borne on a whirlwind to her native mountain, she still remains a mass of rock, from which a trickling stream flows—the symbol of never-ending grief.

THE STORY OF MIDAS

One day Silenus, the teacher and foster father of the wine god Bacchus, wandered off and lost his way. He was found by some peasants of King Midas, who carried the old man to their master. King Midas entertained his guest for ten days and nights with an unceasing round of festivity, and on the eleventh day brought him back safely to his pupil.

To show his appreciation, Bacchus offered to grant any wish that Midas should make. The foolish King, who had a great lust for riches, asked that whatever he might touch be changed into gold. On the way home he put the promise of Bacchus to the test, and to his unbounded joy he saw a twig, an apple, a stone and many other objects turn into shining gold at his touch.

When he arrived at home, Midas ordered his servants to prepare a sumptuous repast. Alas, the bread that he would eat hardened in his hand; the wine he drank was melted gold. He wandered into the garden, and the pretty flowers became rigid and hard when he tried to pluck them. Then his little daughter came running up to him and seized his hand. To his horror he saw the pretty child become stiff and immovable; she was now only a golden image.

Then in despair he raised his arms in prayer to Bacchus, begging to be released from the awful affliction he had brought upon himself. Bacchus mercifully heeded his prayer, and the King heard these words:

"Go to the River Pactolus, trace the stream to its fountain-head, there plunge in your head and body and wash away your fault and its punishment."

Midas obeyed, and no sooner had he touched the waters than his dreadful power left him. But the sands of the Pactolus were changed to shining grains of gold, and so they are to this day. Then the happy King carried home a vessel of the healing water, and restored to their former beauty his little daughter and his pretty flowers.

Midas thereafter was a hater of wealth and splendor, loving rather to worship Pan, god of the woods and fields. On a certain occasion Pan had the audacity to compare his music with that of Apollo and to challenge the god of the lyre to a test of skill. Tmolus, the mountain god, was chosen umpire.

Pan began the contest by blowing his pipes, to which he himself and his faithful Midas listened with the utmost satisfaction. Then up rose Apollo, with his brow crowned with laurel and his purple robe sweeping the ground. In his left hand he held the lyre; with his right hand he evoked wonderful harmony from the strings. Tmolus at once proclaimed Apollo the victor, and all but Midas agreed. The latter insisted that an injustice had been done to Pan.

Apollo was so incensed at this that he declared that such a depraved pair of ears should no longer wear the human form. Thereupon the ears of Midas began to increase in length, to grow hairy without and within, and to become movable on their roots; in fact, in a very short time Midas had the ears of an ass.

To conceal such a mortifying disfigurement from the eyes of the world, Midas had an ample headdress made, but his hairdresser of course knew his shameful secret. The King, however, warned him thus: "Should you betray the secret of my ears to anyone you will be punished by death."

The hairdresser kept still as long as he could, but at last, feeling that he must tell the secret somehow, he went out into the meadow, dug a hole in the ground, stooped down and whispered the story. Then he covered it up. Not long afterwards a thick bed of reeds sprang up in this meadow, and as they waved in the breeze they murmured, "King Midas has ass's ears; King Midas has ass's ears." And so they murmur to this day.

THE STORY OF THE TROJAN WAR

Long ago before the dawn of history a great war raged for ten years between the Greeks and the Trojans. This fierce conflict grew out of failings as old as human nature itself—jealousy, pride, vanity, weakness. It came about in this way.

The sea nymph Thetis was to celebrate her marriage with Peleus, and she planned to make the wedding a most maginficent affair. Accordingly she sent invitations to all the gods and goddesses, excepting only one—Eris, the goddess of discord. But if Thetis hoped to avoid trouble in this manner she was disappointed, for Eris, enraged at this slight, avenged the insult by throwing among the wedding guests a golden apple bearing the legend: "For the fairest."

Three goddesses at once claimed it as their rightful possession: Juno, queen of the gods; Venus, goddess of love and beauty; and Minerva, goddess of wisdom and the arts. Jupiter, being appealed to, dared not brave the wrath of the two who would be disappointed by his decision, and therefore the three claimants chose Paris, the son of King Priam, of Troy.

Years before it had been prophesied that Paris would some day bring trouble to his country; hence Priam had tried to ward off this disaster by leaving the boy on the mountain side to die. A shepherd, however, had rescued him, and at the time our story begins he was tending the flocks on Mount Ida.

Each of the goddesses endeavored to bribe the youthful judge: Juno promised him power and great riches; Minerva, martial fame and glory; Venus, the most beautiful woman on earth for his wife. Paris decided in favor of Venus, thereby winning for himself the undying hatred of Juno and Minerva.

Shortly after this, Paris journeyed to Greece, where he was the guest of Menelaus, King of Sparta. It was the wife of this King, the fair Helen, whom Venus had promised to Paris. The goddess of love worked upon the hearts of both Paris and Helen until the latter agreed to leave her husband and go to Troy, an act which directly brought on the great conflict. For Menelaus, when he discovered the treachery of Paris and the unfaithfulness of his wife, called upon all the Greek war chiefs to help him punish the false guest and restore his wife.

Most of the chieftains responded willingly to his call, though Achilles and Ulysses were hard to win over. The Greeks spent years in preparation, and after many delays and disappointments, they at last set sail for Troy. The Trojans had also been preparing for the enemy's coming, relying chiefly on Hector, the most valiant of the sons of the aged King of Troy.

Nine years passed by with nothing decisive gained. The Trojans finally retired into their well-fortified city, to which the Greeks laid siege. But at the beginning of the tenth year the Greeks almost lost the day because of a quarrel. Achilles, their mightiest warrior, became angry with the leader, Agamemnon, and, taking all of his followers with him, withdrew absolutely from the struggle. Thetis, mother of Achilles, was angered at the way her son was treated, and she petitioned Jupiter to give the Trojans the victory. So, partly on this account, and partly because of the withdrawal of Achilles, the Trojan forces utterly defeated the Greeks and drove them back into their ships.

The Greeks then held a war council. It was agreed that Achilles must be won back by whatever means was possible, and Agamemnon declared himself ready to make amends. Yet, though rich gifts were dispatched to the sulking hero, he refused to become reconciled, and sent back a message that he would return at once to Greece.

Then the Trojans, hearing that Achilles had deserted his countrymen, broke through the ramparts which the Greeks had built around their ships, and would have burned their vessels had not Neptune intervened.

As a last resort the despairing Greeks persuaded Patroclus, dearest friend of Achilles, to plead their cause. Achilles was moved a little by the words of his friend, and consented to permit Patroclus to don his armor and to place himself at the head of his own special troops, the Myrmidons.

Patroclus donned the armor and rushed to the plains of Troy, where he found a fierce battle raging. The Trojans, terrified at the sight of the supposed Achilles, at first fled in dismay. Then they rallied, and suddenly Hector and Patroclus were seen engaged in a death struggle. Some say that Apollo aided Hector; however that may be, Patroclus fell, wounded to death by Hector's spear.

At last was Achilles stirred to action; the death of his beloved friend moved him where gifts, and fair speeches, and pleadings, availed nothing. After a night spent in grieving for the slain Patroclus, Achilles rode forth to avenge his death. Thetis, his mother, had obtained from Vulcan a new and wonderful suit of armor, and clad in this he led the Grecian forces against the enemy.

The Trojans, unable to withstand the Greeks, inspired with new zeal, rushed back into the city,—all but Hector. But even that brave hero was terrified when he saw Achilles approaching in his flashing armor, and turned to flee. Then began a memorable race about the city. Round and round they ran, Achilles seeming not to gain an inch, when Minerva intervened. Assuming the form of Hector's bravest brother, she appeared at the Trojan's side and urged him to turn and defy his opponent, promising aid in the duel. Hector at once gave battle and hurled his spear at Achilles. Then, turning to his brother to ask for another spear, he found himself deserted.

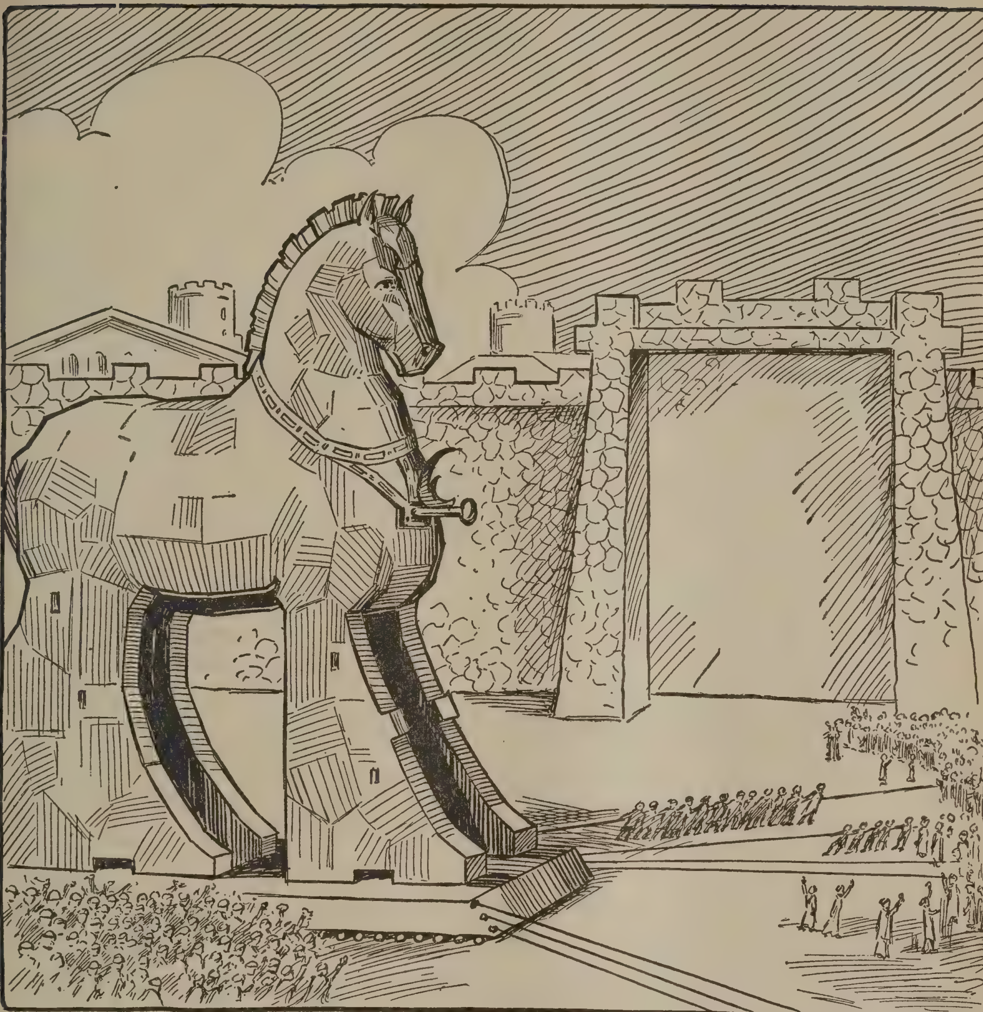
But Achilles, feeling no mercy, at once drove his spear at his helpless foe, and Hector fell mortally wounded. Then, disregarding the Trojan hero's appeal to allow his body to be carried back to Troy for proper burial, he tied the body by strong cords to his chariot and drove back and forth before the gates of Troy in full view of the Trojan forces and the royal family. In vain did the grief-stricken parents beg for the body of their son; the victorious Achilles refused to give up his cruel revenge.

That night, however, the aged Priam went to Achilles in his tent, and at last obtained the body of his son. A twelve-day truce was then agreed upon, during which the Trojans devoted themselves to the funeral ceremonies for their dead hero. Shortly after this, Achilles himself was slain by Paris, who aimed his poisoned arrow at the one vulnerable spot of the hero, his heel. A Grecian chief in his turn shot Paris, and thus died the man who had been responsible for all the years of misery and bloodshed.

Achilles and Hector were now eliminated, and the siege dragged on. Then a prophecy reached the ears of the Greeks. There was in Troy a statue of Minerva, called the Palladium, which was regarded as the guardian of the city. The prophecy was, that not until the Greeks obtained possession of this statue could they hope to capture Troy. Accordingly Ulysses and Diomede disguised themselves, and, entering the city by stealth, stole the statue and bore it away. Even then the Greeks could not capture the city, and they began to give up hope of ever winning the final victory. Then said Ulysses: "If we cannot take the city by force we must take it by stratagem;" and he proceeded to lay before them a plan that seemed certain of success.

They first caused it to be reported to the Trojans that they had abandoned the siege and were returning to Greece, and they gave color to this rumor by withdrawing from their ships and hiding the vessels behind an island near by. But they left something behind them that greatly astonished the Trojans, who now poured forth out of the gates and across the plain in front of the city.

The object of their curiosity was a huge wooden horse, the purpose of which caused them no end of surmise and discussion. Little did they know that it was filled with armed men.



"The Grecian Chiefs, with Cunning Given by Pallas, Mountain High to Heaven a Giant Horse Uprear"

Some said: "Let us take it into the city and present it as an offering to Minerva."

Others cried: "Let us leave it alone. It may bring us harm if we touch it."

Laocoön, priest of Neptune, was loud in his warnings against having anything to do with the mysterious object. "What folly is this, my countrymen!" he cried. "Do you forget the treacherous nature of the Greeks? For my part, I fear them even when they offer gifts." So saying, he struck the side of the horse with his lance, and a strange hollow sound reverberated like a groan.

The people might have been persuaded to follow Laocoön's advice had their attention not been called to a strange occurrence. Just at that moment a group of people came up dragging a Greek

whom they had captured. Immediately the Trojans began to question him. He acknowledged that he was a Greek, though with apparent reluctance, and said that his name was Sinon. The ill will of Ulysses had caused him to be abandoned when his countrymen set sail from Troy.

"Can you tell us," eagerly inquired his questioners, "the purpose of this strange horse?" "Oh, yes!" replied the crafty Sinon. "It was built to propitiate Minerva, who was angered because the Palladium was stolen."

"Why," continued the Trojans, "did you build it so huge?"

After a moment's hesitation Sinon answered: "Why should I not tell you? They who have so ill treated me deserve nothing from me. Calchas the prophet told my people that if the Trojans succeeded in getting the horse within their city they would surely have the victory. So they built it too large for you to take it into your city."

The people were looking at each other questioningly, not quite convinced of the truth of Sinon's words, when a remarkable portent occurred. Juno, determined to see the final defeat of the Trojans, sent of the sea two monstrous serpents, so awful in appearance that the people scattered in terror. The serpents made their way at once to Laocoön, who was standing with his two sons. Wrapping their great bodies about the unfortunate priest and his children, they crushed them to death.

Remembering that Laocoön had been the most outspoken of all against their touching the wooden horse, and had struck the sacred object with his lance, the people decided that the gods were thus manifesting their displeasure at his actions. So, without any more delay, they dragged the huge object into the city, and spent the rest of the day in singing and dancing.

But in the night the wily Sinon let out the men enclosed in the wooden horse, and they opened the city gates to the Greek forces, who had returned after nightfall. Immeditely the Trojan stronghold was at the mercy of the enemy. The city was set on fire in every quarter, and men, women and children were put to the sword.

This was the end of the long struggle, but the adventures of those who escaped from the burning city make many fascinating tales. These have been written down by Homer and Vergil in the *Odyssey* and the *Æneid*.

SKRYMSLI AND THE PEASANTS' CHILD*

Once upon a time in the land of the Far North the giant Skrymsli and a peasant were playing chess. The giant came off victor, and chose for his reward the peasant's only son. "On the morrow," he said to the weeping father, "I will come to claim your child, unless you hide him so cleverly that I cannot find him."

The peasant went home to his wife and told her what had happened. "Let us pray to Odin," cried the mother, heartbroken at the thought of losing her child; "he will help us find a hiding place for our son."

Now Odin was the greatest of all the gods, the god of universal wisdom, but he did not turn a deaf ear to the pleading of the humble peasants. Coming down to earth, he took the boy and changed him into a tiny grain of wheat, which he hid in an ear of grain in the midst of a large field. The giant would never find him here, declared the god.

But Skrymsli was keener than Odin reckoned; when he could not find the boy at home, he strode off to the field. Grasping a scythe, he mowed down the grain with great sweeps, and then selected the very ear in which the child was hidden. Laughing loudly, he was about to put his hand upon the right grain of wheat, when Odin, hearing the cry of

* Adapted from *Myths of Northern Lands,* published by the American Book Company.

the little boy, snatched the kernel out of the great hand. Then the god restored the boy to his parents, saying: "I have done now all that I can for you."

Skrymsli, however, vowed that he had been cheated, and again declared that he would take the child on the morrow unless the parents could outwit him.

The unhappy father and mother now appealed to the god Hoenir, who changed the boy into a bit of down. This down he hid in the snowy breast of a swan, swimming in a pond close by. But Skrymsli was not deceived. Coming up a few minutes later, he caught the swan, bit off its neck, and was about to swallow the bird when Hoenir wafted it away from his lips. The god then restored the boy to his parents, but he warned them that he could never aid them again.

When the giant told the parents that he would make a third attempt to secure the child, they implored the aid of Loki. This god was even more ingenious than the others, for he made a journey to the sea and, having changed the boy into a tiny egg, placed him in a fish.

As the god was returning from this expedition he met the giant, about to embark upon a fishing excursion. Loki insisted on going with him, for he knew the giant was planning to secure the little boy.

Skrymsli baited his hook, and, after angling awhile and catching several fish, finally drew up that one in which the boy was concealed. With a cry of triumph he cut the fish open and began counting the eggs, and soon found the one for which he was looking. Loki at once snatched it out of his grasp, and, having changed the boy to his natural form, set him ashore and whispered in his ear: "Run home; pass through the boathouse and close the door after you."

The terror-stricken child obeyed, but the giant followed close on his heels. The cunning Loki, however, had placed a sharp spike over the doorway, and when the giant passed through, this spike pierced his head. As he sank to the ground, uttering dismal groans, Loki cut off one of his legs. But immediately the pieces knit together.

Thereupon the god cut off the other leg, throwing flint and steel between the severed limb and the trunk to prevent further restoration by means of magic, and soon the giant expired.

The happy peasants thereafter considered Loki the highest of all the heavenly council, for he had given them perpetual deliverance from their enemy.

HOW FLAX CAME TO MANKIND *

The goddess Holda, or Frau Holle, as she was sometimes affectionately called, was greatly revered and loved by the German people in the days of long ago. When the snowflakes came softly down from the sky they would say: "See, the good Frau Holle is shaking her feather bed!" And when the rain refreshed the parched earth they knew she was washing her clothes. Sometimes mothers would point out to their children the lovely white clouds and tell them that the diligent Frau Holle had her linen out to bleach.

This gracious goddess bestowed many rich gifts on mankind, one of the most valuable being the gift of flax. It came about in this way.

There was once a peasant who was accustomed to leave his wife and children in the valley each day and take his sheep up to the mountain pastures. As he watched his flocks he had many opportunities to pursue the mountain game, and many a fine chamois did he bring down with his crossbow.

One day, as he was following a much desired animal, he saw it disappear behind a boulder. To his amazement, on approaching nearer, he found a doorway

* Adapted from *Myths of Northern Lands,* published by the American Book Company.

in the glacier near by, for he was now on the very top of the snow-capped mountain.

As the shepherd passed through the door he found himself in a wonderful cave, sparkling with marvelous jewels and formations of ice and snow. In the center stood a beautiful woman clad in robes of silver, and attended by a host of lovely maidens, all crowned with Alpine roses. Awe-struck, he fell on his knees, and as in a dream heard the voice of the beautiful woman. "What will you choose to take away with you?" she asked.

The shepherd gazed at the sparkling jewels about him, and then his eyes rested on the queenly figure before him. In her hand was a little nosegay of blue flowers. Trembling, he said: "I pray you, may I have those flowers that you hold?"

The goddess Holda, for it was she, smiled happily, and said: "You have chosen wisely, good shepherd; as long as the flowers preserve their freshness shall you live to enjoy the light and joy of earth. Here, take these flowers and also this measure of seed, which you are to sow in your field. Now return to your home in the valley."

As she spoke a crash of thunder sounded which seemed to shake the very foundations of the mountain, the cave disappeared, and the shepherd found himself once more on the mountain side.

When he reached home and described to his wife all that had happened, she upbraided him bitterly, saying that he had brought her only some worthless flowers and seed, when they might have had precious stones.

But the shepherd was content with his choice, especially when the seed, which he sowed, brought forth several acres of grain.

One moonlight night, as he watched the little green shoots and wondered what sort of grain they were, he saw a mistlike form hover over the field, with hands outstretched as if in blessing. Day by day the grain prospered, until at last the field was one mass of blossoms,—countless little flowers as blue as the sunny sky above. After awhile the flowers withered and the seed was ripe.

Then Holda came to teach the shepherd and his wife how to harvest the flax stalks and to spin, weave and bleach the linen they produced. The peasant couple now prospered finely, for while he sowed the seed and harvested the precious crop, she spun, wove and bleached the linen.

One day, after a great many years had passed, the peasant noticed that his nosegay of flowers had wilted and died. Knowing that he, too, must soon die, he climbed the mountain for the last time, came to the doorway, which he had long sought in vain, and again passed through the door into the wonderful cave. He was never again seen nor heard from, but the people in the valley believed that Holda bade him live in the cave and enjoy her gracious care forever and ever.

In the heart of a seed, buried deep, so deep
A dear little plant lay fast asleep.
"Wake," said the voice of the rain-drops bright.
The little plant heard and rose to see
What the wonderful outside world might be.

—*Selected.*

THE GODDESS OF PERPETUAL YOUTH*

Asgard was the beautiful abode of the Scandinavian gods. It was filled with golden and silver palaces, and was approached only by a bridge, the rainbow. One thing alone marred the joy of the gods, and that was the fact that they were not all immortal. Therefore when Idun, the personification of immortal youth, appeared in Asgard, they gave her most joyful welcome. She was accompanied by Bragi, god of music and eloquence, and carried with her a casket of apples, which had the power of conferring immortal youth and loveliness upon all who partook of them.

To win the affection of the gods, Idun promised them a daily taste of her magic fruit. Thus they were able to ward off the approach of old age and disease, and their vigor, youth and beauty continued throughout many ages. The apples, guarded as priceless treasures, never grew any less, no matter how often the gods were invited to partake of them.

It happened one day that three of the gods, Odin, Hoenir and Loki, started out upon one of their customary excursions to earth. After traveling many miles, they found themselves in a region where they could see no dwellings in which to seek rest and food. So they slew one of a herd of oxen grazing near by, kindled a fire and then sat down to rest while the meat cooked.

Though the flames blazed high and roared merrily about the meat, for some reason the flesh of the ox remained raw. Seeking the cause of this, the gods discovered an eagle perched in the tree above them. The bird, seeing himself noticed, then spoke to them and informed them that he would remove the spell if they would give him as much food as he could eat. The gods agreed to do this, and the eagle, swooping downwards, fanned the flames with his huge wings until the meat was cooked.

All would have gone well had not Loki, always on the lookout for mischief, seized a great stake lying near, just as the eagle was about to carry off three-quarters of the ox. Forgetting the magic powers of the bird, the god began to beat him lustily. To his dismay, one end of the stake stuck fast in the eagle's beak, the other to his hands, the bird soared rapidly away, and he found himself now dragged over stones and brambles, now flying through the air. In vain he told the eagle that his arms were being torn from their sockets; in vain he cried for mercy. Finally he promised any ransom if only the eagle would release him.

Now the bird was the storm giant Thiassi in the form of an eagle. He promised to release Loki if the god would swear to lure Idun out of Asgard, so that he might obtain possession of her and of her magic fruit. Loki could do nothing else than promise, though when he returned to his companions he was careful not to tell them how he had purchased his freedom.

A few days later, when Bragi was absent from the city, the mischievous god sought Idun in the groves of Brunmaker, where she had taken up her abode. Artfully he began to describe some apples which grew at a short distance from there. "They are so like yours," he said, "that you would not be able to tell them apart if they were placed side by side." Idun, her curiosity greatly stirred, was thus lured away from home with a crystal dish full of fruit, which she intended to compare with that which he described.

No sooner had they left the heavenly city, however, than Loki forsook her, and before she could return home the storm giant Thiassi swooped down from the North on his eagle wings, caught her up in his cruel talons and carried her swiftly away to his desolate abode, Thrym-heim. There, pale and sad, she pined away, always, however, steadfastly

* Adapted from *Myths of Northern Lands,* published by the American Book Company.

refusing to give to her captor even the smallest bite of her magic fruit.

When, in the course of time, the beneficial effect of the fruit on the gods began to pass away, and they felt themselves growing old and stiff, they bestirred themselves to find the missing goddess of perpetual youth. It was soon discovered that she had last been seen in Loki's company, and when sternly called to account, this mischief-maker had to admit that he had betrayed her into the storm giant's power. Thereupon the gods indignantly commanded Loki to undo the mischief he had wrought, warning him that unless he complied with their command he would forfeit his life.

Loki promised to do his best, and, borrowing the plumage of a falcon, flew off to Thrym-heim. Here he found the sad Idun, lamenting her exile from Asgard and her loved Bragi. Changing the fair goddess into a swallow, Loki seized her tightly in his claws and rapidly winged his way back to Asgard, hoping to elude the storm giant, absent on a fishing excursion.

On the ramparts of the celestial city the gods were all assembled, gazing anxiously in the direction of Thrym-heim. Suddenly they saw Loki coming swiftly toward them, followed by the giant Thiassi, in eagle plumes. Loki strained every effort to make the goal, and at last sank exhausted in the midst of the gods.

They at once set fire to a pile of fuel which they had accumulated, and the flames singed Thiassi's wings and the smoke blinded him. So, when he dropped dazed into their midst, they immediately slew him.

The happy gods now partook of Idun's magic apples, and rejoiced to feel their youth returning to them. And, lest Thiassi's relatives should feel too angry when they heard how the giant had been slain, they vowed to place his eyes as constellations in the heavens.

* * *

This is one of the Norse myths whose symbolism is readily seen. Idun, the emblem of vegetation, is carried away in the autumn, when Bragi, representing the singing of the birds, is absent. The cold wintry wind, Thiassi, compels her to remain in the desolate North, where she pines and languishes until Loki, the south wind, brings back the swallow, the forerunner of spring. The youth, beauty and vigor conferred by Idun are symbolical of Nature's awakening in the spring, when the earth again becomes bright with flowers and gay with singing birds.

Come up, April, through the valley,
  In your robes of beauty drest,
Come and wake your flowery children
  From their wintry beds of rest;
Come and over blow them softly
  With the sweet breath of the south;
Drop upon them, warm and loving,
  Tenderest kisses of your mouth.

—*Phoebe Cary.*

The Bible occupies a unique position in literature. It has not only influenced millions in the past, but it pulsates with life today, gripping the attention, thoughts, and feelings of multitudes of our race. Since the completion of the Bible in the early centuries of our era, its popularity and compelling influence have resulted from the co-working of two principal factors, one of which is that vast numbers find in its pages the foundation of their religious faith.

The Bible as Literature

Our present purpose has to do solely with its value as literature. Our statesmen, poets, orators, writers, men and women of education generally, agree that in the Bible we have our greatest English Classic. As an aid to expression, they diligently study its pages to imbibe the subtle influence of its language, and style. Its contents have been so extensively drawn upon that they have become a part of our national consciousness. They blend themselves with our daily conversation, and allusions to them may be detected in our best readings, giving color more or less distinctly to books, periodicals and papers.

Bible Stories

What is of more importance, considering the object we have in mind, is the conceded fact that it is the greatest source book in the world for good stories. Interspersed in its narratives are stories, which someway lay hold of the heart and imagination of youth. They were written by members of the greatest story telling race in the world, which later produced the Arabian Nights, that holds thrall our story loving generation. There is about them the subtle influence of the Orient. They contain tantalizing glimpses of life and times, and actions when civilization was young. They sparkle with the vivacity and nameless charm of youth.

Necessity for Using Them

To pass them by in any collection of stories is to leave untouched a literary treasure. The boy or girl made familiar with them, not only enjoys the elusive beauty of a style which defies direct analysis, but the moral they contain, even though hidden, in someway finds lodgment in youthful hearts and higher aspirations and ideals result. The stories we have selected are but a few of many. They are not arranged in consecutive order, but are selected almost at random, as stories that are truly "Apples of gold in pictures of silver" illustrative of thought and feeling, the entire gamut of human emotions, among an oriental people at a time when the world was young.

THE GARDEN OF EDEN, HOW ENJOYED AND HOW LOST

And the Lord planted a garden eastward, in Eden, and out of the ground he made to grow every tree that is pleasant to the sight, and good for food; the tree of life also in the midst of the garden, and the tree of the knowledge of good and evil. And a river went out of Eden to water the garden. And the Lord took Adam, and put him into the garden to dress it and to keep it. And the Lord commanded Adam, saying, "Of every tree of the garden thou mayest freely eat: but of the tree of the knowledge of good and evil, thou shalt not eat of it; for in the day that thou eatest thereof thou shalt surely die."

And the Lord said, "It is not good that the man should be alone; I will make an help meet for him." So the Lord made woman and brought her to Adam and she became a help meet unto him, and Adam called her name Eve because she became the mother of all living; and they did live in the garden, but the serpent who was prince of the powers of evil conspired against them.

Now the serpent was more subtle than any beast of the field which the Lord had made. And he said unto Eve, "Hath God said, ye shall not eat of any tree of the garden?" And Eve said unto the serpent, "Of the fruit of the trees of the garden we may eat: but of the fruit of the tree which is in the midst of the garden, we must not eat of it, neither touch it, lest we die." And the serpent said unto the woman, "Ye shall not die; but in the day ye eat thereof, your eyes shall be opened, and ye shall become as Gods knowing good and evil." And so when Eve saw that the tree was good for food, and that it was a delight to the eyes, and that the tree was to be desired to make one wise, she took of the fruit thereof, and did eat; and she gave also unto Adam with her, and he did eat.

And they heard the voice of the Lord walking in the garden in the cool of the day: and Adam and Eve hid themselves from the presence of the Lord amongst the trees of the garden. And the Lord called unto Adam and said, "Where art thou?" And Adam said, "I heard thy voice in the garden, and I was afraid, and I hid myself." And the Lord said, "Hast thou eaten of the tree, whereof I commanded thee that thou shouldest not eat?" And the man said, "The woman whom thou gavest to be with me, she gave me of the tree, and I did eat." And the Lord said unto Eve, "What is this thou hast done?" And Eve said, "The serpent beguiled me, and I did eat."

And the Lord said, "Behold, the man is become as one of us, to know good and evil; and now, lest he put forth his hand, and take also of the tree of life, and eat, and live forever;" therefore the Lord drove them forth from the garden of Eden, to till the ground from whence they were taken.

The Story of the Ark

Now the wickedness of man was great on the earth and the Lord said, "I will destroy both man and beast and creeping things and fowl of the air." But Noah was a righteous man and perfect in his generation and he found grace in the eye of the Lord.

And God said unto Noah, "Make thee an ark of gopher wood; room shalt thou make in the ark, and shalt pitch it within and without with pitch for behold, I do bring a flood of waters upon the earth, to destroy all flesh, wherein is the breath of life, from under heaven; every thing that is in the earth shall die. But I will establish my covenant with thee; and thou shalt come into the ark, thou, and thy sons, and thy wife, and thy sons' wives with thee. And of every living thing of all flesh, two of every sort shalt thou bring into the ark, to keep them alive with thee."

Thus did Noah, according to all that God commanded him, so did he. And the rain was upon the earth forty days and

forty nights. In the selfsame day entered Noah, and the sons of Noah, and Noah's wife, and the three wives of his sons with them, into the ark. And they went in unto Noah into the ark, two and two of all flesh wherein is the breath of life, and the Lord shut them in. And the flood was forty days upon the earth; and the waters increased, and bare up the ark, and it was lifted up above the earth. And the ark went upon the face of the waters. And the waters prevailed exceedingly upon the earth; and all the high mountains that were under the whole heaven were covered. And every living thing was destroyed which was upon the face of the ground, both man, and cattle, and creeping thing, and fowl of the heaven.

Then the Lord remembered Noah. A wind was made to pass over the earth, and the waters were assuaged; the fountains also of the deep and the windows of heaven were stopped, and the rain from heaven was restrained; and the waters returned from off the earth continually; and the ark rested upon the mountains of Ararat, and Noah removed the covering of the ark, and looked, and behold, the face of the ground was dried. And Noah went forth, and his sons, and his wife, and his sons' wives with him; every beast, every creeping thing, and every fowl, whatsoever moveth upon the earth, after their families, went forth out of the ark.

The Origin of Languages

In the beginning the whole earth was of one language and of one speech. And it came to pass, they journeyed in the east, that they found a plain in the land of Shinar and they dwelt there. And they said one to another: "let us make brick, and burn them thoroughly." And they had brick for stone, and asphalt had they for mortar. And they said, "let us build us a city, and a tower, whose top will reach unto heaven, and let us make us a name; lest we be scattered abroad upon the face of the whole earth."

And the Lord came down to see the city and the tower, which the children of men builded. And the Lord said, "Behold, they are one people, and they have all one language; and this is what they begin to do: and now nothing will be withholden from them, which they purpose to do. Let us go down, and there confound their language, that they may not understand one another's speech."

So the Lord scattered them abroad from thence upon the face of all the earth; and they left off to build the city. Therefore was the name of it called Babel because the Lord did there confound the language of all the earth.

Abraham and Lot

This is the story of the migration of people in early times from the Euphrates to Palestine. According to the Bible, Abraham became the ancestors of the Jews and Lot that of the Moabites and Ammonites. The story of their early movements follows:

Now the Lord said unto Abraham, "Get thee out of thy country, and from thy kindred, and from thy father's house, unto the land that I will shew thee." So Abraham went as the Lord had spoken unto him; and Lot went with him; and they went forth to go into the land of Canaan; and into the land of Canaan they came. And behold after many years, Abraham became very rich in cattle, in silver, and in gold. And Lot also, which went with Abraham, had flocks, and herds, and tents. And the land was not able to bear them, that they might dwell together; for their substance was great, so that they could not dwell together. And there was a strife between the herdmen of Abraham's cattle and the herdmen of Lot's cattle. And Abraham said unto Lot, "Let there be no strife; I pray thee, between me and thee, and between my herdmen and thy herdmen; for we are brethren. Is not the whole land before thee? separate thyself, I pray thee, from me; if thou wilt take the left hand, then I will take the right hand; or if thou wilt take the right hand then I will go to the left."

And Lot lifted up his eyes, and beheld all the Plain of Jordan, that it was well watered every where, like the garden of the Lord, like the land of Egypt, as thou goest unto Zoar. So Lot chose him all the Plain of Jordan; and Lot journeyed east; and they separated themselves the one from the other. Abraham dwelled in the land of Canaan, and Lot dwelled in the cities of the Plain, and moved his tent as far as Sodom.

The Destruction of the Cities of the Plain

Now the men of Sodom were wicked and sinners against the Lord exceedingly. And the Lord said, "Because the cry of Sodom and Gomorrah is great, and because their sin is very grievous, I will send mine angels down and see whether it is altogether according to the cry of it."

And the two angels came to Sodom at even; and Lot sat in the gate of Sodom: and Lot saw them, and rose up to meet them; and he bowed himself with his face to the earth; and he said, "Behold now, my lords, turn aside, I pray you, into your servant's house, and tarry all night, and wash your feet, and ye shall rise up early, and go on your way." And they said, "Nay; but we will abide in the street all night." And he urged them greatly; and they turned in unto him, and entered into his house; and he made them a feast, and did bake unleavened bread, and they did eat. But the men of Sodom were evilly inclined and sought to deal wickedly with the strangers and Lot went forth to restrain them. But the men said "Stand back." And they said, "This one fellow came in to sojourn, and he will needs be a judge; now will we deal worse with thee, than with them." And they pressed sore upon Lot, and drew near to break the door. But the angels put forth their hand, and brought Lot into the house to them, and shut to the door. And they smote the men that were at the door of the house with blindness, both small and great: so that they wearied themselves to find the door.

And when the morning arose, then the angels hastened Lot, saying, "Arise, take thy wife, and thy two daughters which are here; lest thou be consumed in the iniquity of the city. But he lingered; and the men laid hold upon his hand, and upon the hand of his wife, and upon the hand of his two daughters; the Lord being merciful unto them: and they brought him forth, and set him without the city. And it came to pass, when they had brought them forth abroad, that he said, "Escape for thy life; look not behind thee, neither stay thou in all the Plain; escape to the mountain, lest thou be consumed." But Lot wished not to escape to the mountains, but entreated that he might find refuge in Zoar and the angel said: "See, I have accepted thee concerning this thing also, that I will not overthrow the city of which thou hast spoken. Haste thee, escape thither; for I cannot do any thing till thou be come thither."

The sun was risen upon the earth when Lot came unto Zoar. Then the Lord rained upon Sodom and upon Gomorrah brimstone and fire from the Lord out of heaven; and he overthrew those cities, and all the Plain, and all the inhabitants of the cities, and that which grew upon the ground.

How Isaac Won Rebekah

And Abraham was old, and well stricken in age. And he said unto his servant, the elder of his house, that ruled over all that he had, "Swear that thou shalt not take a wife for my son of the daughters of the Canaanites, but thou shalt go unto my country and to my kindred, and take a wife for my son Isaac." And the servant took ten camels and all goodly things of his master's, and went to Mesopotamia, unto the city of Nahor. And he made the camels to kneel down without the city by the well of water at the time of evening, when women go out to draw water.

And he prayed, saying, "behold, I stand by the fountain of water; and the daughters of the men of the city come

out to draw water; and let it come to pass, that the damsel to whom I shall say, 'Let down thy pitcher, I pray thee, that I may drink,' and she shall say, 'Drink, and I will give thy camels drink also'; let the same be she that thou hast appointed for thy servant Isaac.'"

And behold, Rebekah came out, with her pitcher upon her shoulder. And the damsel was very fair to look upon, and she went down to the fountain, and filled her pitcher, and came up. And the servant ran to meet her, and said, "Give me to drink, I pray thee, a little water of thy pitcher." And she said, "Drink, my lord"; and she hasted, and let down her pitcher upon her hand, and gave him drink. And when she had done giving him drink, she said, "I will draw for thy camels also, until they have done drinking." And she hasted, and emptied her pitcher into the trough, and ran again to the well to draw, and drew for all his camels.

And it came to pass, as the camels had done drinking, that the servant took a golden ring, and two bracelets for her hands and said, "Whose daughter art thou? tell me, I pray thee. Is there room in thy father's house for us to lodge in?" And she said unto him, "I am the daughter of Bethuel the son of Milcah. We have both straw and provender enough, and room to lodge in." And the damsel ran, and told her mother's house according to these words.

And Rebekah had a brother, and his name was Laban, and it came to pass, when he saw the ring, and the bracelets upon his sister's hands, and when he heard the words of Rebekah his sister, he came unto the servant; and said, "Come in, thou blessed of the Lord; wherefore standest thou without? For I have prepared the house, and room for the camels." And the servant came into the house. And there was set meat before him, but he said, "I will not eat, until I have told mine errand." And Laban said, "Speak on."

And he said, "I am Abraham's servant. And the Lord hath blessed my master greatly. And my master made me swear, saying 'thou shalt go unto my father's house, and to my kindred, and take a wife for my son.' And as I came this day unto the fountain, behold, Rebekah came forth with her pitcher on her shoulder; and she went down unto the fountain. And I bowed my head, and worshipped and blessed the Lord. And now if ye will deal kindly and truly with my master, tell me: and if not, tell me: that I may turn to the right hand, or to the left." Then Laban answered and said, "Behold, Rebekah is before thee, take her, and go, and let her be thy master's son's wife." And Rebekah arose, and her damsels, and they rode upon the camels, and followed the servant. And the servant told Isaac all the things that he had done. And Isaac took Rebekah into his mother's tent and she became his wife and he loved her.

The Winning of Rachel

Jacob, having wronged his brother Esau, fled for safety to his mother's kindred. The story continues:

Then Jacob went on his journey, and came to the land of the children of the East. And he looked, and behold a well in the field, and, lo, three flocks of sheep lying there by it; for out of that well they watered the flocks: and the stone upon the well's mouth was great. And thither were all the flocks gathered: and they rolled the stone from the well's mouth, and watered the sheep, and put the stone again upon the well's mouth in its place. While Jacob spake with them, Rachel came with her father's sheep; for she kept them. And when Jacob saw Rachel the daughter of Laban, his mother's brother, he rolled the stone from the well's mouth, and watered the flock.

And Jacob told Rachel that he was Rebekah's son: and she ran and told her father. And when Laban heard the tidings of Jacob his sister's son, he ran to meet him, and embraced him, and kissed him, and brought him to his house. And Jacob abode with him the

space of a month. And Laban said unto Jacob, "Because thou art my brother, shouldst thou therefore serve me for naught? tell me, what shall thy wages be?" And Jacob loved Rachel; and he said, "I will serve thee seven years for Rachel thy younger daughter."

And Laban said, "It is better that I give her to thee, than that I should give her to another man: abide with me." And Jacob served seven years for Rachel; and they seemed unto him but a few days, for the love he had to her. And Jacob said unto Laban, "Give me my wife, for my days are fulfilled." And Laban gathered together all the men of the place, and made a feast.

But Laban did not want Rachel the younger daughter to marry before her older sister Leah, and by a ruse he had Leah take Rachel's place. When the deceit was discovered Jacob said unto Laban, "What is this thou hast done unto me? Did not I serve with thee for Rachel? Wherefore then hast thou beguiled me?" And Laban said, "It is not so done in our place, to give the younger before the firstborn, we will give thee the other also for the service which thou shalt serve with me yet seven other years." And Jacob did so, and Laban gave him Rachel his daughter to wife.

Joseph and His Envious Brothers

Jacob, whose name had been changed to Israel, had twelve sons. This story tells us how one was sold into slavery.

Now Israel loved Joseph more than all his children, because he was the son of his old age: and he made him a coat of many colors. And his brethren saw that their father loved him more than all his brethren; and they hated him, and could not speak peaceably unto him. This was not the only cause of envy. Joseph dreamed that his father, mother and brethren did obeisance and honor to him. This increased their hate but his father "kept the sayings in mind."

And his brethren went to feed their father's flock in Shechem. And Israel said unto Joseph, "Go now, see whether it be well with thy brethren, and well with the flock; and bring me word again." And Joseph went after his brethren, and found them in Dothan. And they saw him afar off, and before he came near unto them, they conspired against him to slay him. And they said one to another, "Behold, this dreamer cometh. Come now therefore, and let us slay him, and cast him into one of the pits, and we will say, An evil beast hath devoured him: and we shall see what will become of his dreams." But Reuben said unto them "Shed no blood, cast him into this pit that is in the wilderness, but lay no hand upon him" (that he might deliver him out of their hand, to restore him to his father).

And it came to pass, when Joseph was come unto his brethren, that they stripped Joseph of his coat, the coat of many colors that was on him; and they took him, and cast him into the pit; and the pit was empty, there was no water in it. And they sat down to eat bread; and they lifted up their eyes and looked, and, behold, a traveling company of Ishmaelites came from Gilead, with their camels bearing spicery and balm and myrrh, going to carry it down to Egypt. And Judah said unto his brethren, "What profit is it if we slay our brother and conceal his blood? Come, and let us sell him to the Ishmaelites, and let not our hand be upon him; for he is our brother, our flesh."

And his brethren hearkened unto him, and they drew and lifted up Joseph out of the pit, and sold him to the Ishmaelites for twenty pieces of silver. And the Ishmaelites brought Joseph into Egypt, and sold him unto Potiphar, an officer of Pharaoh's, the captain of the guard.

The Dreams Fulfilled

In Egypt Joseph acted so prudently and displayed such wisdom, that he finally rose to royal favor. And Pharaoh took off his signet ring from his hand, and put it upon Joseph's hand and arrayed him in vestures of fine linen, and put a gold chain about his neck: and he made him to ride in the second chariot

which he had; and they cried before him, "Bow the knee:" and he set him over all the land of Egypt.

Then there arose a great famine in Palestine and Joseph's father, Jacob, sent all his sons except Benjamin, the youngest, down to Egypt to buy food. They had to go to Joseph, who was governor, to buy it, and bowed down themselves to him with their faces to the earth. And Joseph saw his brethren but made himself strange unto them, and spake roughly with them; and he said unto them, "Whence come ye?" And they said, "From the land of Canaan to buy food." And Joseph knew his brethren, but they knew not him. And Joseph remembered the dreams which he dreamed of them.

But Joseph was not yet ready to disclose himself. He charged them with being spies and to make sure of their return he retained one of them, Simeon, and told them not to return unless they brought with them their younger brother, Benjamin; but to further increase their fear he had their money placed in the sacks which he filled with grain. Their father refused to allow them to return with Benjamin, saying, "Me have ye bereaved of my children: Joseph is not, and Simeon is not, and ye will take Benjamin away: all these things are against me."

But the famine continued and finally Jacob, their father, felt it necessary to send them to Egypt a second time, and he said, "Do this; take of the choice fruits of the land in your vessels, and carry down the man a present, a little balm, and a little honey, spicery and myrrh, nuts and almonds; and take double money in your hand; and the money that was returned in the mouth of your sacks carry again in your hand; peradventure it was an oversight: take also your brother, and arise, go again unto the man: and God Almighty give you mercy before the man, that he may release unto you your other brother and Benjamin."

And now a number of most interesting incidents attended their meeting with Joseph, who finally could not restrain himself. And he cried, "Cause every man to go out from me." And there stood no man with him, while Joseph made himself known unto his brethren. And he wept aloud: and the Egyptians heard, and the house of Pharaoh heard. And Joseph said unto his brethren, "I am Joseph; doth my father yet live?" And his brethren could not answer him; for they were troubled in his presence. And Joseph said unto his brethren, "Come near to me, I pray you." And they came near. And he said, "I am Joseph, your brother, whom you sold into Egypt. And now be not grieved, nor angry with yourselves, that ye sold me hither: for God did send me before you to preserve life. And ye shall tell my father of all my glory in Egypt, and of all that ye have seen; and ye shall haste and bring down my father hither." And he fell upon his brother Benjamin's neck, and wept; and Benjamin wept upon his neck. And he kissed all his brethren, and wept upon them: and after that his brethren talked with him.

The Finding of Moses

Moses was the great leader and prophet of the Israelites. This is the story of his infancy.

Now there arose up a new king over Egypt. And he said, "Behold, the people of the children of Israel are more and mightier than we. Come on, and let us deal wisely with them, lest they become too many." And the king of Egypt charged all his people, saying, "Every son that is born to the Hebrews ye shall cast into the river, and every daughter ye shall save alive."

And there was a woman of the house of Levi who had a son, and when she saw that he was a goodly child, she hid him three months. And when she could no longer hide him, she took for him an ark of bulrushes, and daubed it with slime and with pitch, and put the child therein, and she laid it in the flags by the river's brink. And his sister stood afar off to know what would be done to him.

Now the daughter of Pharaoh came down to wash herself at the river. And her maidens walked along by the river side. And when the daughter of Pharaoh saw the ark among the flags, she sent her maid to fetch it. And when she had opened it, she saw the child, and behold, the babe wept. And she had compassion on him and said, "This is one of the Hebrew's children."

"THE DAUGHTER OF PHARAOH SAW THE ARK AMONG THE FLAGS"

Then said his sister to Pharaoh's daughter, "Shall I go and call to thee a nurse of the Hebrew women, that she may nurse the child for thee?" And Pharaoh's daughter said to her, "Go." And the maid went and called the child's mother. And Pharaoh's daughter said unto her, "Take this child away, and nurse it for me, and I will give thee thy wages." And the woman took the child and nursed it. And the child grew, and she brought him unto Pharaoh's daughter, and he became her son. And she called his name Moses, and she said, "Because I drew him out of the water."

The Death of Samson

Owing to his remarkable strength, Samson had become a leader and Judge in Israel. He had many contests with their enemies, the Philistines, but he was always the victor. At length by deceit he had been delivered unto them and they put out his eyes and placed "fetters of brass on him and he did grind in their prison house." The story of his death and the revenge he took for their cruel treatment follows.

And the lords of the Philistines gathered them together for to offer a great sacrifice unto their god, for they said, "Our god hath delivered Samson our enemy into our hand." And it came to pass, when their hearts were merry, that they said, "Call for Samson, that he may make us sport." And they called for

Samson out of the prison house; and he made sport before them: and they set him between the pillars. And Samson said unto the lad that held him by the hand, "Suffer me that I may feel the pillars whereupon the house resteth, that I may lean upon them." Now the house was full of men and women; and all the lords of the Philistines were there; and there were upon the roof about three thousand men and women, that beheld while Samson made sport.

And Samson called unto the Lord, and said, "O Lord God, remember me, I pray thee, and strengthen me, I pray thee, only this once, O God, that I may be at once avenged of the Philistines for my two eyes." And Samson took hold of the two middle pillars upon which the house rested, leaned upon them, the one with his right hand, and the other with his left. And Samson said, "Let me die with the Philistines." And he bowed himself with all his might; and the house fell upon the lords, and upon all the people that were therein. So the dead which he slew at his death were more than they which he slew in his life.

The Story of Jephthah's Daughter

This is a story of the times of Judges in Palestine. It shows us how binding were vows and explains the origin of a singular custom.

And Jephthah (the judge and leader of the Jewish forces) vowed a vow unto the Lord and said, "If thou wilt indeed deliver the children of Ammon into mine hand, then it shall be, that whatsoever cometh forth of the doors of my house to meet me, when I return in peace from the children of Ammon, it shall be the Lord's, and I will offer it up for a burnt offering.". So Jephthah passed over unto the children of Ammon to fight against them; and the Lord delivered them into his hand. And he smote them with a very great slaughter. So the children of Ammon were subdued before the children of Israel.

And he said in his heart surely the Lord hath delivered the children of Ammon unto me because of my vow. And Jephthah came to Mizpah unto his house, and, behold, the first that came to meet him was his daughter. She came with timbrels and with dances: and she was his only child; beside her he had neither son nor daughter. And it came to pass, when he saw her, that he rent his clothes and said, "Alas, my daughter! thou hast brought me very low, and thou art one of them that trouble me: for I have opened my mouth unto the Lord, and I cannot go back."

His daughter when she knew the manner of the vow, said unto him, "My father, thou hast opened thy mouth unto the Lord; do unto me according to that which hath proceeded out of thy mouth; forasmuch as the Lord hath taken vengeance for thee of thine enemies, even of the children of Ammon." She said unto her father, "Only this thing be done for me: let me alone two months, that I may depart and go down upon the mountains, and bewail my virginity, I and my companions." And he said, "Go."

And he sent her away for two months: and she departed, she and her companions, and bewailed her virginity upon the mountains, for being young the sorrow was heavy upon her. And behold at the end of two months she returned unto her father, who did with her according to his vow which he had vowed. And it was a custom in Israel that the daughters of Israel went yearly to celebrate the daughter of Jephthah the Gileadite four days in a year.

The Miraculous Flow of Oil

Elisha was another of the prophets of early Israel. This is the story of help afforded a worthy widow in time of need.

Now there cried a certain woman of the wives of the sons of the prophets unto Elisha, saying, "Thy servant my husband is dead: and thou knowest that thy servant did fear the Lord: and the creditor is come to take unto him my two children to be bondmen." And Elisha said unto her, "What shall I do for thee? tell me; what hast thou in the house?"

And she said, "Thine handmaid hath not anything in the house, save a pot of oil." vessels; borrow not a few. And thou shalt go in and shut the door upon thee

"GO, BORROW THEE VESSELS . . . BORROW NOT A FEW . . . POUR OUT INTO ALL THOSE VESSELS"

Then he said, "Go, borrow thee vessels abroad of all thy neighbors, even empty and upon thy sons, and pour out into all those vessels.

So she went from him, and shut the door upon her and upon her sons; they brought the vessels to her, and she poured out. And it came to pass, when the vessels were full, that she said unto her son, "Bring me yet a vessel." And he said unto her, "There is not a vessel more." And the oil stayed. Then she came and told Elisha. And he said, "Go, sell the oil, and pay thy debt, and live thou and thy sons of the rest."

The Story of the Captive Jewish Girl

Now Naaman, captain of the host of the king of Syria, was a great man with his master, and honorable, because by him the Lord had given deliverance unto Syria; he was also a mighty man in valor, but he was a leper. Now the Syrians had gone out by companies, and had brought away captive out of the land of Israel a little maid; and she waited on Naaman's wife. And she said unto her mistress, "Would God my lord were with the prophet that is in Samaria! for he would recover him of his leprosy." And one went in, and told Naaman, saying, Thus and thus said the maid that is of the land of Israel.

And the king of Syria said, "Go to, go, and I will send a letter unto the king of Israel." And Naaman departed, and took with him ten talents of silver, and six thousand pieces of gold, and ten changes of raiment. And he brought the letter to the king of Israel, which said: "Now when this letter is come unto thee, behold, I have therewith sent Naaman my servant to thee, that thou mayest recover him of his leprosy." And it came to pass, when the king of Israel had read the letter, that he rent his clothes, and said, "Am I God, to kill or to make alive, that this man doth send unto me to recover a man of his leprosy? wherefore consider, I pray you, and see how he seeketh a quarrel against me."

And it was so, when Elisha the man of God had heard that the king of Israel had rent his clothes, that he sent to the king, saying, "Wherefore hast thou rent thy clothes? Let him come now to me, and he shall know that there is a prophet in Israel." So Naaman came with his horses and with his chariot, and stood at the door of the house of Elisha. And Elisha sent a messenger unto him, saying, "Go and wash in Jordan seven times, and thy flesh shall come again to thee, and thou shalt be clean." But Naaman was wroth, and went away, and said, "Behold, I thought, he will surely come out to me, and stand, and call on the name of the Lord his God, and strike his hand over the place, and recover the leprosy. Are not Abana and Pharpar, rivers of Damascus, better than all the waters of Israel? May I not wash in them, and be clean?" So he turned and went away in a rage.

And his servants came near, and spake unto him, and said, "My father, if the prophet had bid thee do some great thing, wouldest thou not have done it? how much rather then, when he saith to thee, Wash, and be clean?" Then went he down, and dipped himself seven times in Jordan, according to the saying of the man of God; and his flesh came again like unto the flesh of a little child, and he was clean.

How David Overcame Goliath

David is the great heroic figure in early Jewish history, and the founder of the Jewish monarchy. The theme of the following story is the manner in which, while yet a lad, he delivered the Israelites from the power of the Philistines. It is adapted from the account in First Samuel.

And the hosts of the Philistines sore oppressed the children of Israel, and they drew nigh to do battle, and after the customs of the time, the Philistines sent forth a champion for their side, a mighty many of war and mighty in strength, namely Goliath of Gath. And his shield-bearer went before him, and Goliath stood and cried unto the armies of Israel, "Why are ye come out to set your battle in array? am not I a Philistine, and ye servants to Saul? Choose you a man for you, and let him come down to me. If

he be able to fight with me, and kill me, then will we be your servants: but if I prevail against him, and kill him, then shall ye be our servants, and serve us." And when Saul and all Israel heard these words of the Philistine, they were dismayed, and greatly afraid.

Now David was the youngest son of Jesse, of Bethlehem, and he fed his father's sheep while his brethren went to fight with Saul against the Philistines, and David rose up early in the morning and took presents in his hand and went to salute his brethren and bring word again unto his father. And as he talked with them, behold there came out Goliath the champion and spake according to his words. And David said unto the men that stood by him, "What shall be done to the man that killeth this Philistine?" And the people answered him after this manner saying, "The king will enrich him with great riches, and will give him his daughter, and make his father's house free in Israel." Then went David and said unto Saul, "Let no man's heart fail because of him; thy servant will go and fight with this Philistine." And Saul said to David, "Go, and the Lord shall be with thee."

And Saul would apparel David in his armor, but David would not. And he took his staff in his hand, and chose him five smooth stones out of the brook, and put them in the shepherd's bag which he had, even in his scrip; and his sling was in his hand: and he drew near to the Philistine. And when the Philistine looked about and saw David, he disdained him: for he was but a youth, and ruddy, and withal of a fair countenance. And the Philistine said unto David, "Am I a dog, that thou comest to me with staves?" And the Philistine cursed David by his gods. Then said David to the Philistine, "Thou comest to me with a sword, and with a spear, and with a javelin: but I come to thee in the name of the Lord of hosts, the God of the armies of Israel, which thou hast defied. This day will the Lord deliver thee into mine hand; and I will smite thee, and take thine head from off thee; for the Lord saveth not with sword and spear: for the battle is his, and he will give you into our hand."

And it came to pass, when the Philistine arose, and came and drew nigh to meet David, that David hastened, and ran toward the army to meet the Philistine. And David put his hand in his bag, and took thence a stone, and slang

"AND CHOSE HIM FIVE SMOOTH STONES"

it, and smote the Philistine in his forehead, and he fell upon his face to the earth. So David prevailed over the Philistine with a sling and with a stone, and smote the Philistine, and slew him. And when the Philistines saw that their champion was dead, they fled. But Saul took David that day, and would let him go no more home to his father's house. And Saul set him over the men of war, and it was good in the sight of all the people.

The Destruction of the Prophets of Baal by Elijah

Elijah was a great prophet in Israel. The mission of the prophets was to keep the people of Israel true to the worship of Jehovah. This story purports to be an account of a contest between Elijah and the prophets of Baal.

And the famine was sore in the land. And it came to pass in the third year therof the word of the Lord came unto Elijah, saying, "Go, show thyself to Ahab the king." And when Ahab saw Elijah, he said unto him, "Is it thou, thou troubler of Israel?" And Elijah answered, "I have not troubled Israel; but thou, and thy father's house, in that ye have forsaken the commandments of the Lord, and thou hast followed the Canaanite gods. Now therefore send, and gather to me all Israel unto Mount Carmel, and cause to come the prophets of the Asherah four hundred, which eat at the queen's table." So Ahab sent unto all the children of Israel, and gathered the prophets together unto Mount Carmel.

And Elijah came near unto all the people, and said, "How long halt ye between two opinions? If the Lord be God, follow him; but if Baal, then follow him; let them therefore give us two bullocks; and let the prophets of Baal choose one bullock for themselves, and cut it in pieces, and lay it on the wood, and put no fire under: and I will dress the other bullock, and lay it on the wood, and put no fire under. And call ye on the name of your god, and I will call on the name of the Lord; and the God that answereth by fire, let him be God." And all the people answered and said, "It is well spoken."

And the prophets of Baal took the bullock which was given them, and they dressed it, and called on the name of Baal from morning even until noon, saying, "O Baal, hear us." But there was no voice, nor any that answered. And they leaped about the altar which was made. And it came to pass at noon that Elijah mocked them, and said, "Cry aloud: for he is a god; either he is musing, or he is gone aside, or he is in a journey, or peradventure he sleepeth, and must be awaked." And they cried aloud, and cut themselves after their manner with knives and lances, till the blood gushed out upon them. And it was so, until the time of the offering of the evening oblation; but there was neither voice, nor any to answer, nor any that regarded.

And Elijah said unto all the people, "Come near unto me," and all the people came near unto him. And he repaired the altar of the Lord that was thrown down; and he made a trench about the altar, as great as would contain two measures of seed. And he put the wood in order and cut the bullock in pieces, and laid it on the wood. And he said, "Fill four barrels with water, and pour it on the burnt offering, and on the wood." And he said, "Do it the second time"; and he said, "Do it the third time"; and they did it the third time. And the water ran round about the altar; and he filled the trench also with water.

And it came to pass at the time of the offering of the evening oblation, that Elijah the prophet came near, and said, "Hear me, O Lord, hear me, that this people may know that thou hast turned their heart back again." Then the fire of the Lord fell, and consumed the burnt offering, and the wood, and the stones, and the dust, and licked up the water that was in the trench. And when all the people saw it, they fell on their faces: and they said, "The Lord, he is God; the Lord, he is God." And Elijah said unto them, "Take the prophets of Baal; let not one of them escape." And they took them and slew them.

How Elijah Was Fed

And the famine waxed exceedingly great in Israel, and the word of the Lord came unto Elijah, saying, "Get thee hence; and turn thee eastward, and hide thyself by the brook, that is before Jordan. And it shall be, that thou shalt drink of the brook; and I have com-

"I HAVE COMMANDED THE RAVENS TO FEED THEE"

manded the ravens to feed thee there." So he went and did according unto the word of the Lord: for he went and dwelt by the brook that is before Jordan. And the ravens brought him bread and flesh in the morning, and bread and flesh in the evening; and he drank of the brook. And it came to pass after a while that

the brook dried up, because there was no rain in the land.

And the word of the Lord came unto him, saying, "Arise, get thee to Zarepath, which belongeth to Zidon, and dwell there: behold, I have commanded a widow woman there to sustain thee." So he arose and went to Zarephath; and when he came to the gate of the city, behold, a widow woman was there gathering sticks: and he called to her, and said, "Fetch me, I pray thee, a little water in a vessel, that I may drink." And as she was going to fetch it, he called to her and said, "Bring me, I pray thee, a morsel of bread in thine hand." And she said, "As the Lord thy God liveth, I have not a cake, but an handful of meal in the barrel and a little oil in the cruse: and, behold, I am gathering two sticks, that I may go in and dress it for me and my son, that we may eat it, and die."

And Elijah said unto her, "Fear not; go and do as thou hast said: but make me thereof a little cake first, and bring it forth unto me, and afterward make for thee and for thy son. For thus saith the Lord, the God of Israel. 'The barrel of meal shall not waste, neither shall the cruse of oil fail, until the day the Lord sendeth rain upon the earth.'" And she went and did according to the saying of Elijah: and she, and he, and her house, did eat many days. The barrel of meal wasted not, neither did the cruse of oil fail, according to the word of the Lord, which he spake by Elijah.

The Revolt and Death of Absalom

Absalom was the son of David, but his ambition was to be King. The story of his revolt now follows.

Now in all Israel there was none to be so much praised as Absalom for his beauty. From the sole of his foot even to the crown of his head there was no blemish in him. And he said in his heart, "I would be king in the room of David my father." And he prepared him a chariot and horses and fifty men to run before him, and Absalom rose up early and stood beside the way of the gate (where as the custom was the king acted as judge) and he would say, "Oh, that I were made judge in the land, that every man which hath any suit or cause might come unto me and I would do him justice." And it was so, that when any man came nigh to do him obeisance, he put forth his hand, and took hold of him, and kissed him. And on this manner did Absalom to all Israel that came to the king for judgment: so Absalom stole the hearts of the men of Israel. And Absalom sent spies throughout all the tribes of Israel, saying, "As soon as ye hear the sound of the trumpet, then ye shall say, 'Absalom is king in Hebron.'" And the conspiracy was strong for the people increased continually with Absalom.

And there came a messenger to David, saying, "The hearts of the men of Israel are after Absalom." And David said unto all his servants that were with him at Jerusalem, "Arise, and let us flee; for else none of us shall escape from Absalom: make speed to depart, lest he overtake us quickly, and bring down evil upon us, and smite the city with the edge of the sword." And the king's servant said unto the king, "Behold, thy servants are ready to do whatsoever my lord the king shall choose." And the king went forth and all his household after him and his men of war, and the king stood by the gate side and all the people went out by hundreds and by thousands.

So the people went out into the field against Israel: and the battle was in the forest of Ephraim. And the people of Israel were smitten there before the servants of David, and there was a great slaughter there that day of twenty thousand men. For the battle was there spread over the face of all the country: and the forest devoured more people that day than the sword devoured. And Absalom chanced to meet the servants of David. And Absalom rode upon his mule, and the mule went under the thick boughs of a great oak, and his head caught hold of the oak, and he was taken up between the heaven and the earth; and the mule that was under him went on. And a cer-

tain man saw it, and told Joab, and said, "Behold, I saw Absalom hanging in an oak." And Joab took three darts in his hand, and thrust them through the heart of Absalom, while he was yet alive in the midst of the oak. And ten young men that bare Joab's armor compassed about and smote Absalom, and slew him.

And as the custom was, a runner came and told the king, "Tidings for my lord, the King." And the king said, "Is it well with the young man Absalom?" And the runner answered, "May the enemies of my lord the king, and all that rise up against thee to do thee hurt, be as that young man is." And the king was much moved, and went up to the chamber over the gate, and wept: and as he went, thus he said, O my son Absalom, my son, my son Absalom! would God I had died for thee."

Solomon's Dream

And Solomon went to Gibeon to sacrifice there; for that was the great high place; a thousand burnt offerings did Solomon offer upon that altar. And the Lord appeared to him in a dream by night: and said, "Ask what I shall give thee." And Solomon said, "Thou hast shewed unto thy servant David, my father, great kindness, according as he walked before thee in truth, and in righteousness, and now, O Lord, thou hast made thy servant king instead of David my father: and I am but a little child; I know not how to go out or come in. And thy servant is in the midst of thy people which thou hast chosen, a great people, that cannot be numbered nor counted for multitude. Give thy servant therefore an understanding heart to judge thy people, that I may discern between good and evil; for who is able to judge this thy great people?"

And the Lord said unto Solomon, "Because thou hast asked this thing, and hast not asked for thyself long life; neither hast asked riches for thyself, nor hast asked the life of thine enemies; but hast asked for thyself understanding to discern judgment; behold, I have done according to thy word: Lo, I have given thee a wise and an understanding heart; so that there hath been none like thee before thee, neither after thee shall any arise like unto thee. And I have also given thee that which thou hast not asked, both riches and honor, so that there shall not be any among the kings like unto thee, all thy days." But the Lord did as he had said in the dream and there was none like unto Solomon for wisdom and understanding and he had great riches and honor.

Solomon's Judgment

This is the story told in the Bible as evidence of King Solomon's great wisdom.

Then came there two women unto the king, and stood before him. And the one woman said, "Oh my lord, I and this woman dwell in one house and unto me a son was born, as was also one unto her; there was no stranger with us in the house save we two in the house. And this woman's child died in the night; because she overlaid it. And she arose at midnight, and took my son from beside me, while thine handmaid slept, and laid it in her bosom, and laid her dead child in my bosom. And when I rose in the morning behold, it was not my son which I did bear."

And the other woman said, "Nay; but the living is my son, and the dead is thy son." And this said, "No; but the dead is thy son, and the living is my son." Thus they spake before the king. Then said the king, "The one saith, This is my son that liveth, and thy son is the dead: and the other saith, Nay; but thy son is the dead, and my son is the living." And the king said, "Fetch me a sword."

And they brought a sword before the king. And the king said, "Divide the living child in two, and give half to the one, and half to the other." Then spake the woman whose the living child was unto the king, and she said, "Oh my lord, give her the living child, and in no wise slay it." But the other said, "It shall be

neither mine nor thine; divide it. Then the king answered and said, "Give her the living child, and in no wise slay it: she is the mother thereof." And all Israel heard of the judgment which the king had judged; and they feared the king: for they saw that the wisdom of God was in him, to do judgment.

The Story of Ruth, the Faithful Daughter-in-Law

This is a story of life and times in early Palestine. Its theme is the filial devotion of Ruth to her mother-in-law, Naomi, and her reward. It affords interesting glimpses of early customs. It is an adaptation from the Book of Ruth.

And it came to pass in the days of the Judges that there arose a mighty famine in Israel and a certain man from Bethlehem went to sojourn in the land of Moab, so that they might live and not die, he and his two sons and his wife whose name was Naomi, and the sons took them wives of the women of Moab, and the name of one of them was Ruth. And they dwelt in the land of Moab about ten years, and behold the man and his two sons died in the land of Moab, leaving only Naomi and her two daughters-in-law. And Naomi determined to go again unto Bethlehem the place of her former abode. And she said unto her daughters, "Go, return each of you to your mother's house, and the Lord deal kindly with you as ye have dealt with the dead, and with me." Then she kissed them and they lifted up their voice, and wept.

And one of them, whose name was Orpah, kissed Naomi and went and returned to her mother's house, but Ruth clave unto Naomi, and she said unto Naomi "Intreat me not to leave thee, and to return from following after thee: for whither thou goest, I will go; and where thou lodgest, I will lodge; and thy God shall be my God: where thou diest, will I die, and there will I be buried: the Lord do so to me, and more also, if aught but death part thee and me." And when Naomi saw that she was steadfastly minded to go with her, she left off speaking unto her.

So Naomi returned, and Ruth the Moabitess, her daughter-in-law, with her, which returned out of the country of Moab: and they came to Bethlehem in the beginning of the barley harvest.

And there was in Bethlehem a man mighty in wealth, by the name of Boaz, a kinsman of Naomi's husband; and Ruth said unto Naomi, "Let me now go to the field and glean ears of corn," and she said unto her, "Go, my daughter." And her hap was to light on a part of the field belonging unto Boaz. And behold, Boaz came to see after the manner of the harvest and he said unto the reapers, "The Lord be with you." And they answered him, "The Lord bless thee." Then said Boaz unto his servant that was set over the reapers, "Whose damsel is this?" And the servant answered and said, "It is the Moabitish damsel that came back with Naomi out of the country of Moab." Then said Boaz unto Ruth, "My daughter, go not to glean in another field, neither pass from hence, but abide here fast by my maidens. Let thine eyes be on the field that they do reap, and go thou after them." Then Ruth fell on her face, and bowed herself to the ground, and said unto him, "Why have I found grace in thy sight, that thou shouldst take knowledge of me, seeing I am a stranger?" And Boaz answered and said unto her, "It hath fully been shewed me, all that thou hast done unto thy mother-in-law since the death of thine husband: and how thou hast left thy father and thy mother, and the land of thy nativity, and art come unto a people which thou knewest not heretofore. The Lord recompense thy work, and a full reward be given thee of the Lord, the God of Israel, under whose wings thou art come to take refuge."

Now the custom in Isarel was that when a man died leaving a widow the nearest kinsman should marry her and nourish her. And straightway Naomi acquainted Ruth what manner her conduct should be to remind Boaz of the custom, and this she did. And Boaz said,

"Blessed be thou, my daughter, fear not, I will surely do all that thou requirest, how-be-it there is a kinsman nearer than I. If he will do the part of a kinsman well, but if he will not do the part of a kinsman, then will I, as the Lord liveth."

omi that is come again out of the land of Moab selleth a parcel of land which was her husband's, and if thou will re-

"GO NOT TO GLEAN IN ANOTHER FIELD, NEITHER PASS FROM HENCE"

And straightway he assembled ten men of the elders of the city and said, "Sit ye down in the gates of the city for to be a witness and Judge." And to the kinsman he said before the elders, "Na-

deem it, thou must buy it also of Ruth, the Moabitess, the wife of the dead." And the near kinsman said, "I cannot redeem it for myself, lest I mar mine own inheritance: take thou my right of

redemption on thee; for I cannot redeem it." Now this was the custom in former time in Israel concerning redeeming and concerning exchanging, for to confirm all things; a man drew off his shoe, and gave it to his neighbor: and this was the manner of attestation in Israel.

So the near kinsman said unto Boaz, "Buy it for thyself." And he drew off his shoe. And Boaz said unto the elders, and unto all the people, "Ye are witnesses this day, that I have bought all that was her husband's, of the land of Naomi, moreover Ruth the Moabitess, have I purchased to be my wife." And all the people that were in the gate, and the elders, said, "We are witnesses. The Lord make the woman that is come into thine house like Rachel and like Leah, which two did build the house of Israel, and let thy house be like the house of Perez." So Boaz took Ruth, and she became his wife.

Gehazi, the Covetous Servant, and His Punishment

Naaman, the Syrian general wished to reward Elisha with the rich presents which he had brought. Elisha refused to accept money for his healing and so Naaman had taken his departure.

But Gehazi, the servant of Elisha the man of God, said, "Behold, my master hath spared Naaman, this Syrian, in not receiving at his hands that which he brought; but, as the Lord liveth, I will run after him, and take somewhat of him." So Gehazi followed after Naaman. And when Naaman saw him running after him, he lighted down from the chariot to meet him, and said, "Is all well?" And he said, "All is well. My master hath sent me, saying: 'Behold, even now there be come to me from mount Ephraim two young men of the sons of the prophets; give them, I pray thee, a talent of silver, and two changes of garments.' And Naaman said, 'Be content, take two talents.'" And he urged him, and bound two talents of silver in two bags, with two changes of garments, and laid them upon two of his servants; and they bare them before him.

And when he came to the tower, where Elisha abode he took them from their hand, and bestowed them in the house; and he let the men go, and they departed. But he went in, and stood before his master. And Elisha said unto him, "Whence comest thou, Gehazi?" And he said "Thy servant went no whither." And he said unto him, "Went not mine heart with thee, when the man turned again from his chariot to meet thee? Is it a time to receive money, and to receive garments, and oliveyards, and vineyards, and sheep, and oxen, and menservants, and maid-servants? The leprosy therefore of Naaman shall cleave unto thee, and unto thy seed for ever." And he went out from his presence a leper as white as snow.

The Call of Samuel

Samuel was the great Judge and prophet in Israel in the closing years of the Judges and the first monarchy under Saul. The following is the story of his early boyhood and his call to be a prophet.

And while Samuel was very young his mother, Elkanah, brought him to Eli the priest and said unto him, "For this child I prayed; and the Lord hath given me my petition which I asked of him; therefore I also have granted him to the Lord; as long as he liveth he is granted to the Lord." And Samuel ministered before the Lord, being a child, girded with a linen ephod. Moreover his mother made him a little robe, and brought it to him from year to year, when she came up with her husband to offer the yearly sacrifice.

And in these days, as Eli was very old and his eyes had begun to wax dim, there was no prophet in Israel to whom visions came. But Samuel while yet a child, was laid down to sleep in the temple, before the lamp that was before the ark of God had gone out. And the Lord called "Samuel!" And Samuel said "Here am I" and he ran unto Eli,

and said, "Here am I; for thou calledst me." And Eli said, "I called not; lie down again." And Samuel went and lay down. And the Lord called yet again. "Samuel!" And Samuel arose and went to Eli, "Here am I; for thou calledst me." And Eli answered, "I called not, my son; lie down again." Now Samuel did not yet know the Lord, neither was the word of the Lord yet revealed unto him. And the Lord called Samuel again the third time. And he arose and went to Eli, and said, "Here am I; for thou calledst me." And Eli perceived that the Lord had called the child. Therefore Eli said unto Samuel, "Go, lie down; and it shall be, if he call thee, that thou shalt say, 'Speak, Lord, for thy servant heareth.'" So Samuel went and lay down in his place. And the Lord came, and stood, and called as at other times, "Samuel! Samuel!" Then Samuel said, "Speak, for thy servant heareth."

And the Lord opened Samuel's understanding to know what was in store for Eli and his sons but as for Samuel himself he grew, and the Lord was with him, and Samuel let none of his words fall to the ground. And all Israel from Dan even to Beer-sheba knew that Samuel was established to be a prophet of the Lord.

The Story of Jonah

Now the word of the Lord came unto Jonah, saying, Arise, go to Nineveh, that great city, and cry against it; for their wickedness is come up before me. But Jonah sought wherewith to escape doing as the Lord had commanded him, and he went down to Joppa, and found a ship going to Tarshish; so he paid the fare thereof, and went down into it, to go with them unto Tarshish, from the presence of the Lord. But the Lord sent out a great wind into the sea, and there was a mighty tempest in the sea, so that the ship was like to be broken. Then the mariners were afraid, and cried every man unto his god; and they cast forth the wares that were in the ship into the sea, to lighten it unto them. But Jonah was gone down into the innermost parts of the ship; and he lay, and was fast asleep.

So the ship master came to him, and said unto him, "What meanest thou, O sleeper? arise, call upon thy God, if so be that God will think upon us, that we perish not." And they said every one to his fellow, "Come, and let us cast lots, that we may know for whose cause this evil is upon us." So they cast lots, and the lot fell upon Jonah. Then said they unto him, "Tell us, we pray thee, for whose cause this evil is upon us; what is thine occupation? and whence comest thou? what is thy country? and of what people art thou?" And he said unto them, "I am an Hebrew; and I fear the Lord, the God of heaven, which hath made the sea and the dry land." Then were the men exceedingly afraid, and said unto him, "What is this that thou hast done?" For the men knew that he fled from the presence of the Lord.

Then said they unto him, "What shall we do unto thee, that the sea may be calm unto us?" For the sea grew more and more tempestuous. And he said unto them, "Take me up, and cast me forth into the sea; so shall the sea be calm unto you; for I know that for my sake this great tempest is upon you." Nevertheless the men rowed hard to get them back to the land; but they could not; for the sea grew more and more tempestuous against them. Wherefore they cried unto the Lord, and said, "We beseech thee, O Lord, we beseech thee, let us not perish for this man's life, and lay not upon us innocent blood: for thou, O Lord, hast done as it pleased thee." So they took up Jonah, and cast him forth into sea.

And the Lord prepared a great fish to swallow up Jonah; and after three days Jonah prayed unto the Lord his God and the Lord spake unto the fish, and it cast out Jonah upon the dry land.

Daniel Interprets the King's Dream

In the second year of the reign of Nebuchadnezzar, the king, he dreamed a dream and his spirit was troubled, and

his sleep brake from him. Then the king commanded to call his wise men for to tell the king his dreams. So they came in and stood before the king. And the king said unto them, "I have dreamed a dream, and my spirit is troubled to know the dream." Then spake the wise men to the king, "O king, live for ever: tell thy servants the dream, and we will shew the interpretation." The king answered and said, "The thing is gone from me: if ye make not known unto me the dream and the interpretation thereof, ye shall be cut in pieces. But if ye shew the dream and the interpretation thereof, ye shall receive of me gifts and rewards and great honour; therefore shew me the dream and the interpretation thereof."

The wise men answered before the king, and said, "There is not a man upon the earth that can shew the king's matter: for as much as no king, lord, nor ruler, hath asked such a thing. There is none other that can shew it before the king, except the gods, whose dwelling is not with flesh." For this cause the king was angry and very furious, and commanded to destroy all the wise men of Babylon. So the decree went forth, and the wise men were to be slain; and they sought Daniel and his companions to be slain. Now Daniel was a Hebrew youth of the people of Judah, and God had given him knowledge and skill in all learning and wisdom and understanding in all visions and dreams, and he said "Wherefore is the decree so urgent of the king?" And it was made known unto him. And Daniel went in, and desired of the king that he would appoint him a time, and he would shew the king the interpretation. Then Daniel went to his house, and made the thing known to his companions: that they should desire mercies of the God of heaven concerning this secret. Then was it revealed unto Daniel in a vision of the night. Then Daniel blessed the God of heaven, went in unto the captain of the king's guard, whom the king had appointed to destroy the wise men of Babylon, and said thus unto him; "Destroy not the wise men of Babylon: bring me in before the king, and I will shew unto the king the interpretation."

Then the captain of the guard brought in Daniel before the king in haste, and said thus unto him, "I have found a man of the children of the captivity of Judah, that will make known unto the king the interpretation." The king answered and said to Daniel, "Art thou able to make known unto me the dream which I have seen, and the interpretation thereof?" Daniel answered before the king, and said, "The secret which the king hath demanded, wise men can not shew unto the king; but there is a God in heaven that revealeth secrets, and he hath made known to the king what shall it be in the latter days."

Then did Daniel make known unto the king the dream that had gone from him and the interpretation thereof which God had revealed unto him in a vision saying, "Oh king, thy thoughts came into thy mind upon thy bed, what should come to pass hereafter: and he that revealeth secrets hath made known to thee what shall come to pass. But as for me, this secret is not revealed to me for any wisdom that I have more than any living, but to the intent that the interpretation may be made known to the king, and that thou mayest know the thoughts of thy heart."

And Daniel related to the king the dream that had gone from him which was that of a great image with head of gold and body of diverse materials showing forth the glory of his own reign, being like unto gold for excellency, and foreshadowing what should come to pass afterwards. Then the king fell upon his face, and commanded that they should offer an oblation and sweet odours unto Daniel and the king answered unto Daniel, and said, "Of a truth your God is the God of gods, and the Lord of kings, and a revealer of secrets, seeing thou hast been able to reveal this secret." Then the king made Daniel great, and gave him many great gifts, and made him to rule over the whole province of Babylon.

"AND NO MANNER OF HURT WAS FOUND UPON HIM"

Daniel in the Lion's Den

It pleased Darius to set over the kingdom an hundred and twenty satraps, which should be throughout the whole kingdom: and over them three presidents, of whom Daniel was one; that these satraps might give account unto them, and that the king should have no damage. And Daniel was distinguished above the presidents and the satraps, because an excellent spirit was in him; and the king thought to set him over the whole realm.

Then the presidents and the satraps, sought to find occasion against Daniel as touching the kingdom; but they could find none occasion nor fault; for as much as he was faithful, neither was there any error or fault found in him. Then said these men, "We shall not find any occasion against this Daniel, except we find it against him concerning the law of his God." Then these presidents and satraps assembled together to the king, and said thus unto him, "King Darius, live for ever. All the presidents of the kingdom, the deputies and the satraps, the counsellors and the governors, have consulted together to establish a royal statute, and to make a strong interdict, that whosoever shall ask a petition of any god or man for thirty days, save of thee, O king, he shall be cast into the den of lions. Now, O king, establish the interdict, and sign the writing, that it be not changed, according to the law of the Medes and Persians, which altereth not.

Wherefore King Darius signed the writing and the interdict. And when Daniel knew that the writing was signed, he went into his house (now his windows were open in his chamber toward Jerusalem); and he kneeled upon his knees three times a day, and prayed, and gave thanks before his God, as he did aforetime. Then these men assembled together, and found Daniel making petition and supplication before his God. Then they came near, and spake before the king concerning the king's interdict: "Hast thou not signed an interdict, that every man that shall make petition unto any god or man within thirty days, save unto thee, O king, shall be cast into the den of lions?" The king answered and said, "The thing is true, according to the law of the Medes and Persians."

Then answered they and said before the king, "That Daniel, which is of the children of the captivity of Judah, regardeth not thee, O king, nor the interdict that thou hast signed, but maketh his petition three times a day." Then the king, when he heard these words, was sore displeased, and set his heart on Daniel to deliver him: and he labored till the going down of the sun to rescue him. Then they assembled together unto the king, and said unto him, "Know, O king, that it is a law of the Medes and Persians, that no interdict nor statute which the king establisheth may be changed." Then the king commanded, and they brought Daniel, and cast him into the den of lions. Now the king spake and said unto Daniel, "Thy God whom thou servest continually, he will deliver thee." And a stone was brought, and laid upon the mouth of the den; and the king sealed it with his own signet, and with the signet of his lords.

Then the king went to his palace, and passed the night fasting: neither were instruments of music brought before him: and his sleep fled from him. Then the king arose very early in the morning, and went in haste unto the den of lions. And when he came near unto the den to Daniel, he cried with a lamentable voice: the king spake and said to Daniel, "O Daniel, servant of the living God, is thy God, whom thou servest continually, able to deliver thee from the lions?" Then said Daniel unto the king, "O king, live for ever. My God hath sent his angel, and hath shut the lions' mouths, and they have not hurt me: Forasmuch as before him innocency was found in me; and also before thee, O king, have I done no hurt." Then was the king exceeding glad, and commanded that they should take Daniel up out of the den. So Daniel was taken up out of the den, and no manner of hurt was found upon him, because he had trusted in his God.

The Three Hebrew Children Cast into the Fiery Furnace

Nebuchadnezzar the king made an image of gold, whose height was threescore cubits, and the breadth thereof six cubits; he set it up in the plain of Dura, in the province of Babylon. Then the king sent to gather together all the rulers of the provinces, to come to the dedication of the image, which Nebuchadnezzar the king had set up. Then the satraps, the deputies, and the governors, the judges, the treasurers, the counsellors, and sheriffs, and all the rulers of the provinces, and they were gathered together unto the dedication of the image. Then the herald cried aloud, "To you it is commanded, O peoples, nations, and languages, that at what time ye hear the sound of music, ye shall fall down and worship the golden image; and whoso falleth not down and worshippeth shall the same hour be cast into the midst of a burning fiery furnace. And who is the god that can deliver him?"

Wherefore at that time certain Chaldeans came near, and brought accusation against the Jews. They answered and said to Nebuchadnezzar the king and said: "O king, live for ever. There are certain Jews whom thou hast appointed over the affairs of the province of Babylon, Shadrach, Meshach, and Abednego, these men, O king, have not regarded thee: they serve not thy gods, nor worship the golden image which thou hast set up." Then the king in his rage and fury commanded to bring them. They brought these men before the king, and he said unto them, "Is it of purpose ye three that ye serve not my god, nor worship the golden image which I have set up? Now if ye be ready that at what time ye hear the sound of the cornet, flute, harp, sackbut, psaltery, and dulcimer, and all kinds of music, ye fall down and worship the image which I have made, well: but if ye worship not, ye shall be cast the same hour into the midst of a burning fiery furnace; and who is that god that shall deliver you out of my hands?"

And they answered and said, "Be it known unto thee, O king, that we will not serve thy gods, nor worship the golden image which thou hast set up." Then was Nebuchadnezzar full of fury, and the form of his visage was changed against them, therefore he spake, and commanded that they should heat the furnace seven times more than it was wont to be heated. And he commanded certain mighty men that were in his army to bind the three Hebrew children and to cast them into the burning fiery furnace. Then these men were bound in their hosen, their tunics, and their mantles, and their other garments, and were cast into the midst of the burning fiery furnace. Therefore because the king's commandment was urgent, and the furnace exceeding hot, the flame of the fire slew those men that took them up, but Shadrach, Meshach, and Abednego, fell down bound into the midst of the burning fiery furnace.

Then the king was astonished, and rose up in haste; he spake and said unto his counsellors, "Did not we cast three men bound into the midst of the fire?" They answered and said unto the king, "True, O king." He answered and said, "Lo, I see four men loose, walking in the midst of the fire, and they have no hurt; and the aspect of the fourth is like a son of the gods." Then Nebuchadnezzar came near to the mouth of the burning fiery furnace: he spake and said, "Ye servants of the Most High God, come forth and come hither." Then Shadrach, Meshach, and Abednego, came forth out of the midst of the fire. And the satraps, the deputies, and the governors, and the king's counsellors, being gathered together, saw these men, that the fire had no power upon their bodies, nor was the hair of their head singed, neither were their hosen changed, nor had the smell of fire passed on them.

Nebuchadnezzar spake and said, "Blessed be the God of Shadrach, Meshach, and Abednego, who hath sent his angel, and delivered his servants that trusted in him, and have changed the king's word, and have yielded their

bodies, that they might not serve nor worship any god, except their own God. Therefore I make a decree, that every people, nation, and language, which speak any thing amiss against their God, shall be cut in pieces, because there is no other god that is able to deliver after this sort."

"AND THE KING SAW THE PART OF THE HAND THAT WROTE"

The Mysterious Handwriting

Belshazzar the king made a great feast to a thousand of his lords, and drank wine before ten thousand. Belshazzar, while he tasted the wine, commanded to bring the golden and silver vessels which Nebuchadnezzar his father had taken out of the temple which was in Jerusalem; that they might drink therein. Then they brought the golden vessels that were taken out of the temple of the house of God, which was at Jerusalem; and they drank wine, and praised the gods of gold, and of silver, of brass, of iron, of wood, and of stone. In the same hour came forth the fingers of a man's hand, and wrote over against the candlestick upon the plaster of the wall of the king's palace: and the king saw the part of the hand that wrote.

Then the king's countenance was changed in him, and his thoughts troubled him; and the joints of his loins were loosed, and his knees smote one against another. The king cried aloud

and said to the wise men of Babylon. "Whosoever shall read this writing, and shew me the interpretation thereof, shall be clothed with purple, and have a chain of gold about his neck, and shall be the third ruler in the kingdom." Then came in all the king's wise men: but they could not read the writing, nor make known to the king the interpretation. Then was king Belshazzar greatly troubled, and his countenance was changed in him, and his lords were perplexed.

Now the queen by reason of the words of the king and his lords came into the banquet house: the queen spake and said, "O king, live for ever; let not thy thoughts trouble thee, nor let thy countenance be changed: there is a man in thy kingdom, in whom is the spirit of the holy gods; and in the days of thy father light and understanding and wisdom, like the wisdom of the gods, was found in him. Now let Daniel be called, and he will shew the interpretation."

Then was Daniel brought in before the king. The king spake and said unto Daniel, "Art thou that Daniel, which art of the children of the captivity of Judah, whom the king my father brought out of Judah? I have heard of thee, that the spirit of the gods is in thee, and that light and understanding and excellent wisdom is found in thee. And now the wise men, the enchanters, have been brought in before me, that they should read this writing, and make known unto me the interpretation thereof; but they could not shew the interpretation of the thing. But I have heard of thee, that thou canst give interpretations, and dissolve doubts: now if thou canst read the writing, and make known to me the interpretation thereof, thou shalt be clothed with purple, and have a chain of gold about thy neck, and shalt be the third ruler in the kingdom."

Then Daniel answered and said before the king, "Because that thou O Belshazzar, hast not humbled thine heart, though thou knewest what has gone before, but hast lifted up thyself against the Lord of heaven; and they have brought the vessels of his house before thee, and hast drunk wine in them; and, thou hast praised the gods of silver, and gold, of brass, iron, wood, and stone, which see not, nor hear, nor know, and the God in whose hand thy breath is, and whose are all thy ways, hast thou not glorified: then was the part of the hand sent from before him, and this is the interpretation of the thing. God hath numbered thy kingdom, and brought it to an end, thou art weighed in the balances, and art found wanting, thy kingdom is divided, and given to the Medes and Persians."

Then commanded Belshazzar, and they clothed Daniel with purple, and put a chain of gold about his neck, and made proclamation concerning him, that he should be the third ruler in the kingdom. In that night Belshazzar the Chaldean king was slain. And Darius the Mede received the kingdom.

The Story of Esther

This is the story of life in the Royal Court of Persia, and how Esther, the queen, a Jewish maiden, saved the life of her people, and the origin of the Feast of Purim.

There was a certain Jew in Shushan the palace, whose name was Mordecai. And he brought Esther, his uncle's daughter; for she had neither father nor mother, and the maiden was fair and beautiful; and when her father and mother were dead, Mordecai took her for his own daughter. And it came to pass that a decree went forth from Ahashuerus the king, that fair maidens should be gathered from all the provinces and that the one who pleased the king most should be queen. And Esther was one of the maidens only she told not who her kindred was, for Mordecai had so charged her. And Esther obtained favor in the sight of all who looked on her, and the king loved her above all the women so that he set the royal crown upon her and made her queen, and he made a great feast, even Esther's feast in her honor. But still she told not of her kindred, but kept the commandments of Mordecai

even as when she was a child. And Mordecai sitting in the king's gate, heard a conspiracy on the king which he acquainted Esther who told the king, which was a great favor to him.

Now Haman the king's counsellor was a crafty man, how-be-it the king delighted to honor him, and Haman hated Mordecai for that he would not do honor unto him, and he disliked exceedingly all of Mordecai's people, even all the Jews, but he wist not that queen Esther was a Jewish maiden and niece to Mordecai. And Haman conspired in his heart to bring about the destruction of the Jews and procured a decree from the king that on a day certain they were all to be put to death and all that they had seized for the king's treasury. And great sorrow came on all the Jews because of this. And when Esther the queen knew of this she put on her royal apparel, and stood in the inner court of the king's house, over against the king's house; and the king sat upon his royal throne in the royal house, over against the entrance of the house.

"SO ESTHER DREW NEAR AND TOUCHED THE TOP OF THE SCEPTER"

And it was so, when the king saw Esther the queen standing in the court, that she obtained favour in his sight: and the king held out to Esther the golden sceptre that was in his hand. So

Esther drew near, and touched the top of the sceptre. Then said the king unto her, "What wilt thou, queen Esther? and what is thy request? it shall be given thee even to the half of the kingdom." And Esther the queen said, "If now I have found favor in thy sight let the king and Haman come to the banquet I shall prepare for them and I will do on the morrow as the king saith." Then went Haman forth glad and joyful of heart for the honor shown him. Nevertheless when he saw that Mordecai would not bow down before him he felt exceedingly bitter towards him and ordered that a great gallows should be built, whereon Mordecai should be hanged after that the king had given his royal consent, and on the morrow he was to go with the king unto queen Esther's banquet, which was a great honor for, save the king, no other man was invited.

On that night could not the king sleep; and he commanded to bring the book of records of the chronicles, and they were read before the king. And it was found written, that Mordecai had told of those that kept the door, who had sought to lay hands on the king Ahasuerus. And the king said; "What honour and dignity hath been done to Mordecai for this?" Then said the king's servants that ministered unto him, "There is nothing done for him." And the king said, "Who is in the court?" Now Haman was come into the outward court of the king's house, to speak unto the king to hang Mordecai on the gallows that he had prepared for him. And the king's servants said unto him, "Behold, Haman standeth in the court." And the king said, "Let him come in." So Haman came in.

And the king said unto him, "What shall be done unto the man whom the king delighteth to honour?" And Haman thought in his heart "this honor is to be for me." And he straightway spoke unto the king that such a man should be arrayed in royal robes and made to ride on a horse through the streets of the city while a herald proclaimed that thus the king delighted to honor one who had done him a service. Then the king said to Haman. "Make haste, and take the apparel and the horse, as thou hast said, and do even so to Mordecai the Jew, that sitteth at the king's gate; let nothing fail of all that thou hast spoken." Then took Haman the apparel and the horse, and arrayed Mordecai, and caused him to ride through the street of the city, and proclaimed before him, Thus shall it be done unto the man whom the king delighteth to honour.

In great bitterness of heart Haman did even this great honor unto Mordecai the Jew, and with great fear he bethought him of the decree he had procured that the Jews should be put to death and still he wist not that Esther the queen was also a Jewess. Then the king and Haman come to banquet with Esther the queen, and the king said, "What is thy petition, queen Esther? and it shall be granted thee: and what is thy request? even to the half of the kingdom it shall be performed." Then Esther the queen answered and said, "If I have found favour in thy sight, O king, and if it please the king, let my life be given me at my petition, and my people at my request: for we are sold, I and my people, to be destroyed, to be slain, and to perish." Then spake the king Ahasuerus and said unto Esther the queen, "Who is he, and where is he, that durst presume in his heart to do so?" And Esther said, "An adversary and an enemy, even this wicked Haman." Then Haman was afraid before the king and the queen. And the king arose in his wrath, from the banquet of wine. Then said one of the chamberlains that were before the king, "Behold also, the gallows fifty cubits high, which Haman hath made for Mordecai, who spake good for the king, standeth in the house of Haman." And the king said, "Hang him thereon." So they hanged Haman on the gallows that he had prepared for Mordecai. Then was the king's wrath pacified. And to this day the Jews celebrate every year the Feast of Purim in memory of Esther the queen and the great service she rendered them.

BIRTH OF JESUS

Now the birth of Jesus Christ was on this wise: It came to pass in those days, there went out a decree from Cæsar Augustus that all the world should be enrolled. And all went to enroll themselves, every one to his own city. And Joseph also went up from Nazareth, into Judea, to the city of David, which is called Bethlehem, because he was of the house and family of David; to enroll himself with Mary his wife. And thus it is that while we speak of Jesus of Nazareth, he was born in Bethlehem and so also was prophecy fulfilled. And as the number of those coming to be enrolled was very great, Joseph and wife were forced to take quarters in a stable and there Jesus was born and laid in a manger.

But there were shepherds abiding in the field, and keeping watch by night over their flocks. And an angel of the Lord stood by them, and the glory of the Lord shone round about them: and they were sore afraid. And the angel said unto them, "Be not afraid; for behold, I bring you good tidings of great joy which shall be to all the people: for there is born to you this day in the city of David a Saviour, which is Christ the Lord. And this is the sign unto you; ye shall find the babe lying in a manger." And suddenly there was with the angel a multitude of the heavenly host praising God, and saying:

"Glory to God in the highest,
And on earth peace among men in whom he is well pleased."

And it came to pass, when the angels went away from them into heaven, the shepherds said one to another, "Let us now go even unto Bethlehem, and see this thing that is come to pass, which the Lord hath made known unto us." And they came with haste, and found both Mary and Joseph, and the babe lying in the manger. And when they saw it, they made known concerning the saying which was spoken to them about this child. And all that heard it wondered at the things which were spoken unto them by the shepherds. But Mary kept all these sayings, pondering them in her heart. And the shepherds returned, glorifying and praising God for all the things that they had heard and seen, even as it was spoken unto them by the angel.

The Visit of the Wise Men

Now when Jesus was born in Bethlehem of Judea in the days of Herod the king, behold, wise men from the East came to Jerusalem, saying, "Where is he that is born King of the Jews? for we saw his star in the east, and are come to worship him." And when Herod the king heard it, he was troubled, and all Jerusalem with him. And gathering together all the chief priests and scribes of the people, he inquired of them where the Christ should be born. And they said unto him "In Bethlehem of Judea: for thus it is written by the prophet."

And thou Bethlehem, land of Judah,
Art in no wise least among the princes of Judah:
For out of thee shall come forth a governor,
Which shall be shepherd of my people Israel.

Then Herod privily called the wise men, and learned of them carefully what time the star appeared. And he sent them to Bethlehem, and said, "Go and search out carefully concerning the young child; and when ye have found him, bring me word, that I also may come and worship him." And they, having heard the king, went their way; and lo, the star, which they saw in the east, went before them, till it came and stood over where the young child was. And when they saw the star, they rejoiced with exceeding great joy. And they came into the house and saw the young child with Mary his mother; and they fell down and worshipped him; and

opening their treasures they offered unto him gifts, gold and frankincense and myrrh. And being warned of God in a dream that they should not return to Herod, they departed into their own country another way.

Jesus Questioning the Rabbis in the Temple

And the child Jesus grew, and waxed strong and was filled with wisdom, and the grace of God was upon him. And his parents went every year to Jerusalem at the feast of the passover. And when he was twelve years old, they went up after the custom of the feast: and when they had fulfilled the days, as they were returning, the boy Jesus tarried behind in Jerusalem: and his parents knew it not: but supposing him to be in the caravan, they went a day's journey; and they sought for him among their kinsfolk and acquaintance: and when they found him not, they returned to Jerusalem, seeking for him.

And it came to pass, after three days they found him in the temple, sitting in the midst of the teachers, both hearing them, and asking them questions: and all that heard him were amazed at his understanding and his answers. And when his parents saw him, they were astonished: and his mother said unto him, "Son, why hast thou thus dealt with us? Behold, thy father and I sought thee sorrowing." And he said unto them, "How is it that ye sought me? Wist ye not that I must be in my Father's house?" And they understood not the saying which he spake unto them. And Jesus went down with them, and returned to Nazareth; and was subject unto them. But his mother kept all these sayings in her heart.

The Wonderful Catch of Fishes

Now it came to pass, while the multitude pressed upon him and heard the word of God, that he was standing by lake Galilee, and he saw two boats standing by the lake: but the fishermen had gone out of them, and were washing their nets. And he entered into one of the boats, which was Simon Peter's and asked him to put out a little from the land. And he sat down and taught the multitudes out of the boat.

And said unto Simon Peter, "Put out into the deep, and let down your nets for a draught." And Simon answered and said, "Master, we toiled all night, and took nothing: but at thy word I will let down the nets." And when they had this done, they inclosed a great multitude of fishes; and their nets were breaking; and they beckoned unto their partners, James and John, sons of Zebedee, in the other boat, that they should come and help them. And they came, the fishes filled both the boats, so that they began to sink. But Simon Peter, when he saw it, fell down at Jesus' knees, saying, "Depart from me; for I am a sinful man, O Lord." For he was

"THEY INCLOSED A GREAT MULTITUDE OF FISHES"

amazed, and all that were with him, at the draught of the fishes which they had taken.

The Stilling of the Storm

And after that the multitude were fed Jesus perceived that they would make him king, and he withdrew into the mountains alone. And when evening came, his disciples went down unto the sea; and they entered into a boat, and were going over the sea unto the other side. And it was now dark, and Jesus had not yet come to them. And the sea was rising by reason of a great wind that blew. When therefore they had rowed about five and twenty or thirty furlongs, they behold Jesus walking on the sea, and drawing nigh unto the boat: and they were afraid. But he saith unto them, "It is I; be not afraid." They were willing therefore to receive him into the boat. And he rebuked the wind, and said unto the sea, "Peace, be still." And the wind ceased, and there was a great calm. And he said unto them, "Why are ye fearful? Have ye not yet faith?" And they feared exceedingly, and said one to another, "Who then is this, that even the wind and the sea obey him?"

The Raising of Jairus' Daughter

And there cometh one of the rulers of the synagogue, Jairus by name; and seeing him, he falleth at his feet, and beseecheth him much, saying, "My little daughter is at the point of death: I pray thee, that thou come and lay thy hands on her, that she may be made whole, and live." And he went with him; and a great multitude followed him, and they thronged him.

While he yet spake, they come from the ruler of the synagogue's house, saying, "Thy daughter is dead: why troublest thou the Master any further?" But Jesus, not heeding the word spoken, saith unto the ruler of the synagogue, "Fear not, only believe."

And they come to the house of the ruler of the synagogue; and he beholdeth a tumult, and many weeping and wailing greatly. And when he was entered in, he saith unto them, "Why make ye a tumult, and weep? The child is not dead, but sleepeth." And they laughed him to scorn. But he, having put them all forth, taketh the father of the child and her mother and them that were with him, and goeth in where the child was. And taking the child by the hand, he saith unto her, "Damsel, arise." And straightway the damsel rose up, and walked; for she was twelve years old.

And they were amazed straightway with a great amazement. And he charged them much that no man should know this: and he commanded that something should be given her to eat.

The Multitude Fed

And he saith unto his disciples, "Come ye yourselves apart into a desert place, and rest a while." For there were many coming and going, and they had no leisure so much as to eat. And they went away in the boat to a desert place apart. And the people saw them going, and many knew them, and they ran there together on foot from all the cities, and went out to them.

And he came forth and saw a great multitude, and he had compassion on them, because they were as sheep not having a shepherd: and he began to teach them many things. And when the day was now far spent, his disciples came unto him, and said, "The place is desert, and the day is now far spent: send them away, that they may go into the country and villages round about, and buy themselves somewhat to eat." But he answered and said unto them, "Give ye them to eat." And they say unto him, "Shall we go and buy two hundred pennyworth of bread, and give them to eat?" And he saith unto them, "How many loaves have ye? Go and see." And when they knew, they say, "Five, and two fishes." And he commanded them that all should sit down by companies upon the green grass. And they sat down in ranks, by hundreds, and by fifties. And he took the

five loaves and the two fishes, and looking up to heaven, he blessed, and brake the loaves; and he gave to the disciples to set before them: and the two fishes divided he among them all. And they did all eat, and were filled. And they took up broken pieces, twelve basketfuls, and also of the fishes. And they that ate the loaves were five thousand men.

Dorcas Restored to Life

Now there was at Joppa a certain disciple named Dorcas: this woman was full of good works and almsdeeds which she did. And it came to pass in those days, that she fell sick and died: and when they had washed her, they laid her in an upper chamber. And as Lydda was nigh unto Joppa, the disciples, hearing that Peter was there, sent two men unto him, entreating him, "Delay not to come on unto us." And Peter arose and went with them. And when he was come they brought him into the upper chamber: and all the widows stood by him weeping, and shewing the coats and garments which Dorcas made, while she was with them. But Peter put them all forth, and kneeled down, and prayed; and turning to the body, he said, "Dorcas, arise." And she opened her eyes; and when she saw Peter, she sat up. And he gave her his hand, and raised her up; and calling the saints and widows, he presented her alive.

Paul's Shipwreck

But when the fourteenth night was come, as we were driven to and fro in the sea of Adria, about midnight the sailors surmised that they were drawing near to some country. And fearing lest haply we should be cast ashore on rocky ground, they let go four anchors from the stern, and wished for the day. And while the day was coming on, Paul besought them all to take some food, saying, "This day is the fourteenth day that ye wait and continue fasting, having taken nothing. Wherefore I beseech you to take some food: for this is for your safety: for there shall not a hair perish from the head of any of you." And when he had said this, and had taken bread, he gave thanks to God in the presence of all: and he brake it, and began to eat. Then were they all of good cheer, and themselves also took food. And when they had eaten enough, they lightened the ship, throwing out the wheat into the sea. And when it was day they knew not the land: but they perceived a certain bay with a beach, and they took counsel whether they could drive the ship upon it. And casting off the anchors, they left them in the sea, at the same time loosing the bands of the rudders; and hoisting up the foresail to the wind, they made for the beach. But lighting upon a place where two seas met, they ran the vessel aground; and the foreship struck and remained unmoveable, but the stern began to break up by the violence of the waves. The centurion commanded that they which could swim should cast themselves overboard, and get first to the land: and the rest, some on planks, and some on other things from the ship. And so it came to pass, that they all escaped safe to the land.

NATURE'S LESSON
Bound in White

THE CHANGING YEAR

Our object is to arouse that instinctive love for nature latent in all children. We are not concerned in teaching botany or zoology even in their rudiments. We propose to take a series of walks, one for each season, and let the children become acquainted with the flowers in their secluded home, telling them the common names of some flowers, also the names of some of the animals to be met. The great point is to note the changing lessons nature has to give. Let us walk and talk of animals and plants and note the different appeals nature makes at different seasons of the year. The boy that knows where violets grow, what birds are singing in the trees, the different activities of animals in winter and in summer, is the one that will most readily profit by the more formal instructions of later years.

Let us say to mothers that few things will bind so closely the hearts of your children to you as thus to walk with them in nature's garden. Technical education on your part is not required, a broad general knowledge being all that is necessary. Display sympathy with them, be quick to call attention to interesting bits of local coloring, recall all the anecdotes you may have heard bearing on the subject of your walk, point out wide analogies. And to teachers, let the little ones become acquainted with flowers, birds, and animals in the way here suggested. Beware of the supposed necessity of imparting bits of technical knowledge during the preliminary walks. Sepals, petals, cotyledons, scientific names of animals and plants, outlines for study, can all wait.

In such walks as these the emphasis is placed on getting acquainted with out-of-doors. Where can the best view be had? What are some of the flowers of spring? of fall? how does the scenery of winter compare with that of summer?

This Means You

All boys and girls that love trees and flowers and animals are invited to come and walk with us through the fields and woods, and study the varying lessons Mother Nature has prepared for us at different seasons of the year. She has them in different bindings: white, green, golden, and brown, and each one is as interesting as a fairy story. In some places, there is not a great difference between summer and winter binding. Way down South, you almost have to look in the almanac to know whether it in summer or winter. We do not have that trouble in the North, as you know, for the evidence is in the air and all around us.

The most of our trees have undressed themselves, the flowers have gone to sleep, and Mother Nature has exchanged her beautiful summer dress of green for the drab one of autumn, preparatory to donning her slumber robes of white before tucking herself under the snow for her three months' nap. Many of our birds have given their farewell concert and gone to winter resorts in the South. But for all that, the winter lesson has charms of its own, only we must not be afraid of a little cold weather if we are to get the good of it. No one can exhaust nature's lessons. You may think you have learned all she has to tell, but you are only in the A, B, C grade. Not even the greatest professor that ever lived can explain all the mysteries connected with the tiniest form of life, or the most common of daily experiences. If you only knew all about a little simple flower, you would be so wise that kings and queens would ask you to visit them.

"THE YELLING HOUNDS"

Our Winter Tramp

We will take our first tramp in the winter season, the resting time of nature, though, of course, in countless directions, you will soon discover that her activities are as marked as ever. In a large section of our country the forces of nature displayed in flowers and trees and vegetation generally at this time are quiescent; but when we venture into the woods and fields, we come upon life and incidents full of instruction for us. So let us take our way. In the air, there is tonic for our bodies; and if we make a wise choice in time, we shall find beneath our feet an account of animal doings, recorded in Mother Nature's way, which we must read while it is fresh for it will soon be erased by sun and wind. I have a reason for taking this day for our ramble. It snowed last night and the various winter wide-awakes have unconsciously made a written report for us. We would not

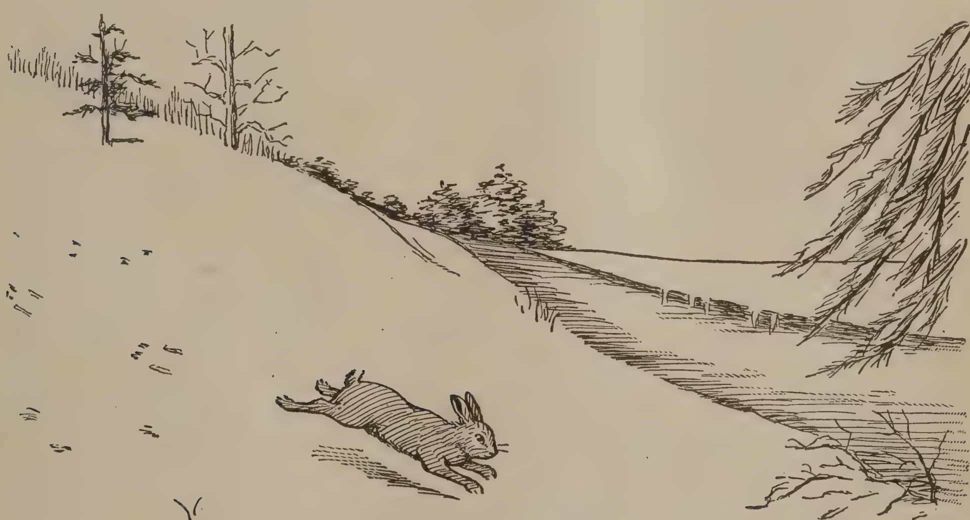
walk if the storm had been a blizzard and the snow had fallen in deep dry, powdery drifts, for then we could hardly follow a trail if we should find one. We should not walk, either, if the snow be heavy and wet, for at such times animals stay in their snug retreats until the snow melts, knowing, as they do, that the soft, slushy stuff will soon disappear. The snow we have is just right, it lies even and smooth, an inch or two deep, and just damp enough to pack into tight snowballs.

Writings on the Snow

You must not be disappointed if we do not see many birds and four-footed animals on this ramble, for it is not easy for owls and other birds that stay with us through the winter months to wade through deep snow in the woods and fields, while fur bearers generally make quick little journeys after food and water and hurry back to their burrows or hollow trees. We can count ourselves lucky if we see anything more than a few squirrels and rabbits that are dressed in their winter coats, and so, like us, venture out in all kinds of weather. But Mother Nature does not confine herself to motion picture scenes of animal life, but flashes on this white screen written statements of a most interesting and varied character, explaining the plot. You note that not even a tiny field-mouse has taken a step from his hole without leaving his record for you to read. You will, however, need to put on a good pair of imagination-glasses to make out the details of this winter story bound in white, but there is much for us to study. Animals of which we learn little in summer, because they are scarce or are mainly active at night, now tell us of their wanderings, how and where they secured food, where they went for water, and whether they ran, trotted, walked, or ambled; stopped to make a call, or enjoy a fight. It is all written for us to read.

All About Bunny

Here is a rabbit track. We can tell it easily. It is in bunches of four marks, two long and broad, two smaller, and we see that bunnies jump in a leap frog fashion, his two wide-apart hind-feet in front, though this statement sounds strange. Let us follow his trail and discover what he was doing. He was a frisky bunny for here he had capered about in the snow, and he had his ap-



"THE TERRIFIED BUNNY"

petite along and wanted something for lunch, as in this place he had stood up to gnaw the bark of a green oak sapling. How big do you think he was? Just measure the height he was able to reach on the sapling. That is about his length stretched out, not exact to the inch, but close enough for us. Now put on your imagination-glasses and see how good you are at making out this picture writing. Look carefully. See these other tracks coming up in the footpath, through the birches? They are dog tracks. They join the tracks of the rabbit. Now if you are a good reader, here is an interesting story. Along the edge of the woods, clear down to the bushy ridge, you can read of a race for life. It is fun to read it, but you may be sure it was exciting for bunny.

Perhaps it is all in our imaginations, but this is the record written for us by those long-flinging footprints in the snow. We can see it all—the terrified bunny, the yelling hounds, nip and tuck, in a burst of speed across the open field that left a gap in the wind behind. It had all come as a surprise to bunny. The hounds had climbed the hill on the scent of a fox, for we can see his tracks, and had started the rabbit unexpectedly. Off he had gone with a jump, and the dogs forgot all about the fox. But bunny made his escape, for following the tracks into the bushes we can find no sign of a tragedy and we are glad of it. Probably from some safe distance the fox stopped and had a good laugh, in a fox's way, at the dogs. Yes, laugh. Didn't you know that animals laugh or something like it? They do not ha-ha and ho-ho, as we do, but I know our dog, when we play with him laughs in a dog's way. When animals feel good they show their feelings in some way, and that is what we do when we laugh. But we must hurry on. Where will we go? We want to find more track accounts to read.

Where to Look for Tracks

We soon learn what kind of tracks are to be expected in definite sections. Thus a swift stream or any piece of open water like this little creek is sure to attract many of the winter wide-awakes, especially minks and muskrats. Near bushy or weedy growths, along old fences, beside low thickets, or in dry, sedgy marshes, we will find mice the most

"SOME SOLEMN OWL HAS SAT IN WAIT"

numerous and active, their trails crossing and recrossing, in some places like railroad tracks at a busy junction, or a large freight terminal. Here, too, is naturally a good place to look for signs of foxes and big snowy owls. If we find where some solemn owl has sat in wait for the

mice, or pounced upon one of the little fellows, there will be curious marks to study. We wish to get all the benefits possible from our walk, so we must take time to read with more care the story of some of these tracks. Out of this pile of bushes runs a medly of mice tracks. A dozen white-footed mice may have traveled that road since the snow ceased falling. Following them, we find ourselves descending the woods toward the garden patch below. Halfway down, we come to a great red oak, into a hole at the base of which, as into the portal of some mighty castle, runs the road of the mice. That is the end of it. There is not a single straying footprint beyond the tree. Reach in your hand and you will find a bunch of chestnut shells, hickory nuts, and several neatly rifled hazelnuts. Perhaps there was a nest or family of mice living under the brush pile that for some good reason kept their stores in the recesses of this old oak. Or was this some squirrel's barn that the rascals were robbing?

Where Birds Delight to Stay

A weedy field, sheltered somewhat from storms, is the second-best place for wild trails, mostly bird-tracks. A field abounding with goldenrod, sticktights of various sorts, mullein, and other heady weeds in the shelter of a wood, with perhaps clumps of black haw and wild plum —is considered an ideal place for winter birds. A search in yon field can hardly fail to show where snowflakes, tree-sparrows, horned larks, redpolls, and perhaps goldfinches have been at work. All around seedy stalks of the right kind, little trails are clustered and confused, reminding us of the mice-tracks in the swamp, but much more thickly grouped. We will have to cross this little creek to get to the woods yonder. Some of the boys may look for a good place to cross. Do you hear the crows calling? Crows are sociable birds and they generally are credited with a good supply of bird sense. While waiting for the boys to find a place to cross, I will tell you about:

The Puzzled Crow

Lately I chanced upon a solitary crow, without being seen by it. I was passing at the time through a little wood, walking upon the frozen creek that divided it. The ice was clear as crystal and every object on the bed of the stream was plainly to be seen. The crow before me was held by some strong influence to a particular spot. At times it gazed solemnly upon or through the ice; then walked round and round, as though looking for some opening therein; then, returning to the fascinating spot, again looked steadfastly down.

I was curious to know what the attraction might be, and approached the troubled bird. It was loath to leave, and flew reluctantly toward the meadows, cawing petulantly as it left the wood. I found beneath the ice, where the crow had lingered, the skinned body of a muskrat, lodged in so appropriate a spot as a bed of mussels. A tempting feast, this, for the hungry crow, which was puzzling its poor brains to determine why such plenty should be left in full view, and yet inaccessible. Every movement of the crow suggested that it was thinking; certainly it was determined to reach that food, if within its power. There are those who insist that birds can not think. I wish that all such could have seen this crow. No single act bore special evidence of thought, but the bird's whole manner spoke volumes.

The Foolish Muskrats

And now notice these wallowy tracks leaving the water's edge. They are those of a muskrat that for some unaccountable reason left the safe retreat of his winter home for a little jaunt. Just as your handwriting enables others to judge somewhat of your character, so you can read the character of these writers in the snow. The timidity, the indecision, the lack of purpose, the restless, meaningless curiosity of this muskrat are evident from the first in the starting, stopping, returning, going-on track he has plowed out in the thin snow. He

did not know where he was going or what he was going for; he knew only that while he wished to go back, he kept going on; he wanted to go to the right or to the left, yet he kept moving straight ahead.

We will follow this trail, for it is not often that these water rats venture out for a stroll. Here is a big wallow in the snow where he stopped to rest and think it over. But instead of returning to his home and continuing his sleep, as a right minded rat should, he continued on, exposing himself to all sorts of needless dangers. We will follow his trail across the meadow, along the stone wall, too high for him to climb over. Here he ventured across the road through the orchard and up a knoll, and—and—well here he met his doom. His tracks stop, but notice the markings on the snow? Those were made by two great wings that lightly brushed it. It is all clear: a passing owl was delighted to find his dinner walking to meet him and "gathered him in." There are several different morals ending that record, but we will only mention one: "Be sure you are right then go ahead."

And the Birds

We must not forget to admire the beauties of this winter day. The sun is shining after the snow. The wind has not been blowing, and see trees, branches, even little twigs are dressed in white, and now let us stop to note some of the birds, for not all have journeyed to the South. Here are some chattering jays. They are getting all the fun they can out of their surroundings. They enter heartily into the spirit of this white wintry day, and play what we may call a game of snow-showering. Flitting and fluttering through the laden twigs these joyous birds are often lost in a cloud of whirling flakes, from which they emerge, screaming wildly their delight. If we look sharply, we may see a partridge, at any rate if we visit that alder patch we will probably come across their tracks.

The Bird with Snow-Shoes

Did you know that Mother Nature, looking after the welfare of all her animal children, furnishes partridges with snow-shoes? She knows that heavy birds, like partridges, are going to have a hard time hunting their food when snow is on the ground. Their little sharp claws would sink far down into soft snow; so when winter comes, a double row of bristles grows out from the sides of each toe and this acts as a snow-shoe.

All of nature's children, whether boys and girls or lower animals, have some traits in common. You feel better when the sun is shining; so do our little feathered friends in winter. We will tell you about

Birds and Sunshine

This is a phase of winter sunshine worthy of notice. It is observed when dense, dull gray clouds obscure the sun, except for the briefest intervals. The effect on our birds is marked. Passing the long smilax thickets, where you might expect to see and hear various birds, at least tree-sparrows, there is absolute silence. Even if you force your way into the little openings in the tangle, or throw stones into it, or, standing near, shout long and loudly, it all matters not. There is not a chirp to be heard; no, nor the rustling of a dead leaf; but, just wait until the sunshine breaks through some rift in the clouds. Immediately, a score or perhaps a hundred birds mount to the upper branches of the shrubs or mazy tangle of the brier, and music forthwith floats along the hill.

Birds That Have Snow Houses

Not only do some birds have snow shoes but some live under the snow if necessary. We probably can not find any grass finches in our walk, but they are frequent in some sections. Not even the highest and widest of snowdrifts can drive a grass finch from his native field, for if necessary he will burrow under it, and find many a meal of grass seed where other birds would starve. When an un-

usual snow-fall occurs, the finches take refuge in the angles of old worm-fences, and the bottom rail is sure to afford some shelter unless the drift forms. From this vantage-ground, the bird will work beneath the snow for several feet and get at seed-bearing weeds that are quite hidden from birds flying over the fields. Let such severe weather occur that every other bird would be driven away, even then grass finch would not be dislodged.

The Winter Thaw

This is the first good snow of the winter, it is very probable that in a week or so Mother Nature will melt it all off, flush out the creeks and fill up the springs and ponds, and we will have our January thaw. Did you know that some of our winter friends make a regular jubilee out of such thaws? Minks, muskrats, hawks, and crows, particularly, are on the alert for the benumbed mice, snakes, turtles, and insects that are now, if not helpless, at least at a great disadvantage. All day long, they prowl along the shores of the new-born lake and congregate on the little islands that are formed by the knolls. And when the flood has fairly passed, we will notice a ribbon like scroll running round the base of little hills and tussocks that project above the general level. It is the shore line of the little flood, and you find it to be composed of such strange material as sun-dried mud, dead grass, twigs, stranded bushes, and here and there a drowned animal.

A Closer Look at the Trees

You have heard of the man who could not see the forest on account of the trees? If we do not stop and look at the trees, we are going to miss much of the joy of our walk. How many do you know, festooned in snowy mantels? Judging from the position of the snow, which way did the wind blow? You must enjoy them now, for in a short time either the coaxing sun beams, or soft calling winds are going to free the glistening branches. The evergreens are now in their glory. The hemlocks on the hills definantly thrust their stubby branches aloft, while the more graceful firs modestly droop beneath their snowy burdens. Let us go and jar that little tree; it looks very beautiful, but it seems tired. Now listen and as the snow falls, you can almost hear a sigh of relief as the branches straighten.

"FESTOONED IN SNOWY MANTELS"

Our Debt to Evergreens

Did you ever think how lost we would be at Christmas time without evergreens? Who knows but Mother Nature had all that in mind when she fashioned ever-

greens? "Here are my children, men," she may have reasoned, "I really must furnish them with something to serve as decoration at Christmas time." So, perhaps, that is one reason we have holly for wreaths to hang about the house, and graceful fir trees to stand on pedestals and trim with candles, pop corn and bags of candy, to set off our presents. There are lots of trees we could better spare than the Christmas tree. Here is our chance to get acquainted with evergreens, for no plant or tree reveals its true character except in its natural surroundings, where it is played upon by winter wind and snow. So we must become acquainted with these winter greens in the out-of-door world, where wind and rain, hail and snow have helped to develop them. With their finely divided needles, these trees offer no such body to the wind's passage as the broad-leaved trees of summer, so they can withstand, unharmed, the winter's blasts, and preserve, even on bleak mountain-sides, the beautiful symmetry of their forms. We have only to linger beneath the pine trees to realize that the wind is no disturber or destroyer to them. Whether the breeze is from the warm southwest and breathes softly with a sighing murmur over the plumy boughs, or sweeps down with stronger, more insistent force upon these sensitive harp strings, the trees respond alike with harmonious motion and sound.

The Sturdy Hemlock

No other tree, however, has so wide a range of expression as the hemlock. The fernlike fronds of the terminal sprays, which are so lightly upraised in summer, begin to droop as autumn approaches, for the small cones are formed and their slight weight is sufficient to depress the slender twigs. With the first light snow of winter, the branches are bowed until they hang gracefully pendent, or the heavy ice storms weigh them down utterly until the branches sweep the snow crust or lie prone upon it. But the snow of last night was not heavy enough for such results; just enough to produce the pleasing effect of snowy plumes.

When the Ice Comes

We really must take another walk after a night of sleet and rain, then we will see everything glazed with a coating of ice. The trees, glaring like metal in the lamp-light, bend and sway before the storm until their branches rattle and clash together, like bayonets and swords when joined in battle. The trees strain and bend until their ice-casings crack and split apart; and, at intervals, some overweighted maple or willow branch, high up among the tree-tops, is torn from the trunk and falls with a crash of splintered fragments on the hard snow crust near by. The hemlocks shine with crystal sheen from crest to base, their ice-armored boughs drooping heavily.

You must let this winter scene impress itself on your mind, because next summer, when these trees put on their coats of green, you will hardly recognize them. You see, in the summer time, no one tree seems to welcome our companionship. Then, they are great, green sunshades. They are the inner walls of a house, and it is like going out of doors when we leave the woods. But on such a winter day as this, every tree is a companion and has an unspoken welcome for us. Walk up to that old oak, it speaks of strength and independence; what a sturdy character it is. That thorn apple reminds you of a crabbed, sour, fault-finding person; but these oaks, beeches, chestnuts, on our left, inspire no such feelings.

How Still It Is

Now, all stand still and feel the silence. Not a twig trembles, the dead leaves are too limp to crackle beneath our feet. Dainty frost crystals are plentifully strewn over the dwarfed bushes by the roadside, and a film of glittering ice with jagged sides reaches out from the banks of this near by brook. The ice nowhere reaches wholly across the stream, and so it is more beautiful by reason of the inky

waters that sluggishly flow beneath it. That black knob that just now shows above the surface is not the rounded end of a protruding stick. No, it is an inquisitive turtle that is investigating us. It is no use to try and stare him out of countenance; when he is satisfied, he will return to his hidden retreat.

Around the Springs

I hope our walk thus far has convinced you that if Mother Nature is not quite as energetic and vigorous as during the summer, she is far from being asleep, even though she has paused long enough to put on her slumber robe. If there were no green things in or about the springs in winter, they would be cheerless spots, in spite of the many forms of animal life that frequent them. The fact that it is winter would constantly intrude if the water sparkled only among dead leaves. Happily, this is not the case. Notice this spring at the base of the hill. At every spring that we find during our ramble, there will be an abundance of chickweed, bitter-dock, and a species of forget-me-not, none in bloom, but all as fresh and bright as if it were June. Then, too, in advance of the plant proper, we find the matured bloom of the skunk-cabbage (would that it had as pretty a name as the plant deserves), with its sheath-like covering, bronze, crimson, golden, and light green, brightening many a dingy spot where dead leaves have been heaped by the winds all winter long. These fresh growths cause us to forget that the general outlook is so dreary, and give to the surrounding scenery a naturalness that would otherwise be wanting.

"AROUND THE SPRINGS"

And not only about the springs but in them, often choking the channels until little lakes are formed, are found many plants that know no summer of growth and then a long interval of rest. The conditions of the season are too nearly alike, while in winter there is less increase, growth never entirely ceases, and certainly the bright green of the delicate foliage is never dulled. Waterweed is found in profusion at all the larger springs, if not water-starwort. The latter is as delicate as the finer ferns and often conceals much of the water in which it grows as it has both floating and submerged leaves.

Winter Foliage

About the springs on southern hillsides, we see the vivid green fronds of evergreen and Christmas ferns drooping upon the wet, brown oak leaves. Among the thawing icicles and snow that frame them about, these fronds seem more highly colored than ever before. Along the roadsides or in the fields, where the wind has swept them bare, the "Winter rosettes" will be found. The parent plants of the evening primrose, thistle, moth-mullein, and many more, show only dried and broken stalks above the snow; but, beside them, these first-year growths appear as many-sided stars or circles of leaves symmetrically arranged about the center. In the balance and order of their parts, these rosettes suggest the forms of snow crystals.

In the swamp, we see the tough, lustrous leaves of laurel and holly, while the hemlock woods protect, beneath their drooping boughs, the rattle-snake plantain, wintergreen, arbutus, and ground-pine, all showing traces of green color, while swaying to the cold ripples of the brook, and leaning against the ice-covered bank, the watercress glows in vivid emerald.

An Insect Tiger

You never heard of him, did you? Let me introduce him. Perhaps we can find him in this spring, for he does not object to ice cold water. And—well, here are two of them; they gather in such places as this where twigs and dead leaves have drifted about. He hunts in the water. Notice his wide and flat body. He has flattened, swimming legs behind, but the front ones are fitted for seizing and holding his victim. They are waiting for some of those small fish over there in that corner, among the moss, to come out. You see the fish are hunting their dinner, feeding on minute forms of life that most on-lookers overlook. And thus you see how nature keeps an equilibrium. She gives every form of life the best possible means of self-protection, but then she allows them all to prey on each other. So, while the fish are banqueting on their prey, these insect tigers are waiting for the fish. Have you an aquarium? If you have, let some of these water bugs live there and war is declared at once. They know perfectly well of each other's presence. The bugs are taking advantage of every move possible to get at the fish, the fish, with equal wisdom, keep out of their way.

Going Home

Talking about eating, how would you like a good warm dinner yourself? That reminds us that we must go home. Now, how many of you can find your way home? Many animals can keep their directions much better than the average boy or girl. You could bring a little pig out here in the woods, all wrapped up in a blanket, put him down on the ground and after one or two little squeals, he would start home in the most direct line possible. No danger of losing him. I think that, in general, wild animals keep their wits about them when they are surprised. They are never at a loss what move to make, and it is the best possible one for them under the circumstances. I am not certain but they have a mental picture, or map, of all the surrounding country and know every inch of the ground. Every brush heap and tanglewood is to them a town, with whose streets and alleys they are acquainted. I will tell you about:—

The Belated Skunk

This skunk went out hunting one fine night. He had been well trained, and he believed in getting home in good seasonable hours, at any rate before sunrise. But this time something detained him, perhaps he had to attend some skunk lodge, or maybe he was just detained by business. At any rate, it was broad day light, long after the sun was up, before he got along to my barn yard. Now, his home was under the side porch and he used a little opening to get there. But the trouble was my dog was on the job also, and while the skunk knew perfectly well where he wanted to go, the dog was ready to dispute the way. But it was a case of necessity, so the skunk put on a bold front. It ran this way and that, never far at a time, and always faced the dog, who did not have quite courage enough to close in. The skunk shook his huge tail, bristled its long fur, snapped, squeaked, dodged, but with every move he was getting nearer and nearer the opening that led to safety. At last he saw a good chance, and making as ferocious an appearance as possible, which so scared the dog that he backed off several feet, with a defiant squeak, the skunk bolted and the next moment he was safe. I had been such an interested onlooker that I forgot to interfere. The skunk had fairly earned his life for the time being.

The Return

But you see we are getting home. Here is where we followed the rabbit tracks, and from this little hill—you can see your homes. Now I am going to ask you to sit down when you get home and are rested, and write a short account of this walk, and we will see who can remember most of the details. Did you know that no two folks see things quite the same? I have a suspicion that your accounts are going to differ considerably. And I will tell you another thing, what you saw the first part of your walk, you will remember much better than what you have just seen. It is so in everything. What interests us in the morning falls flat in the evening; the song of morning birds always seems sweeter than those of evening.

In one way, I hope you will make an exception to this general rule. This tramp is only the first one, but I hope you will not find it the most interesting. When we walk again, it will be in the spring, and we are going to find a great many things to study and talk about. I feel sure you will learn that every season has beauties of its own to charm; each, its lesson to instruct.

The Spring comes slowly up this way,
Slowly, slowly!
A little nearer every day.
She hath delicious things to say,
But will not answer yea or nay,
Nor haste her secrets to display.

NATURE'S LESSON
Bound in Green

Are you sure it is spring? How do you know? The almanacs have one time for spring to begin;—scholars who study the stars, another. Of course, you know all about these dates. But Mother Nature delights in variation. She seems to have different time tables. Some years, she seems good naturedly to allow her animals and plants to rest for days, perhaps a week or even longer than usual; then, perhaps the very next year, she arouses them enough earlier to make up the average. We will tell you one way to know when spring really gets along.

When it is getting-up time, you generally hear, perhaps in your room or maybe in church towers or other public buildings clocks striking the hour. Nature has several ways in which to announce the arrival of spring. As we do not wish to tramp before spring is really here, we will stop at this little hill, where we found the rabbit tracks last winter, and listen for the calls of spring. Hear them? What? Why frogs of course! You can have no spring before you hear the frogs. The first shrill notes, heard before the ice is fairly out of the marshes, will be the waking call of the tiny tree frog that you will find in the woods later on in the summer. Then, as the spring advances and this silvery sleigh-bell jingle tinkles faster, other voices will join; the soft croak of the spotted leopard frog, the still softer, melancholy quaver of the common toad, and, away down at the end of the scale, the deep, solemn bass of the great bullfrog.

The Tree Toad

You will need sharp eyes if you are to see many things that see you perfectly well. Let us stop at this old, gnarled apple tree standing in this pasture. Years and years ago, there was an orchard here and this tree is all that is left of it. Here it is, forsaken in its old age. It is untrimmed and shaggy, cattle and horses and sheep lay around in its thin shade; only a few wrinkled little apples grow on it, and it is hollow. But that old tree is home to many of nature's spring tenants. Now, look sharp. Do you see that little, weazened face, tree toad poking his head out of the knot hole in the hollow of the limb? You love your home I am sure. Well, toads have this home instinct very strongly marked. I will tell you about our toad near our home.

On moving into our house some years ago, we found a tree toad living in a big hickory by the porch. For the next three springs he reappeared, and all summer long we would find him, now on the tree, now on the porch, often on the railing backed tight up against a post. "Was he one or many?" we asked. Then we marked him; and for the next four years, we knew that he was himself alone.

It was very wonderful, to me, the instinct for home that this humble little creature showed. He had a home, had it in a tree, too,—in a hickory tree,—and

dwelt by my house. Here he lived, single and alone for four years. He would go down to the meadow when the toads gathered there to lay their eggs; but back he would come, without mate or companion, to his tree. Stronger than love of kind, than love of mate, constant and dominant in his slow, cold heart was his instinct for home.

Hats Off to the Toad

I never pass this old apple tree in the summer, but I stop to pay my respects

"HE IS THE GUARDIAN OF THE TREE"

to the toad; nor in the winter, that I do not pause and think of him asleep in the tree. He is no longer a mere toad. He is the guardian of the tree, warring in the green leaf against worm and grub and slug; in the dry leaf hiding himself, a heart of life, within the thin ribs, as if to save the old shell of a tree to another summer. Often in the dusk, especially the summer dusk, I go over to sit at his feet and learn some of the things that my school-teachers and college professors did not know.

When we go on into the woods near the creek, I am confident we will find many toads. Take a good look at their coloring. Can any of you tell me why they are wearing such a pale pepper and salt suit? Do you not think that such a colored and mottled suit helps them to hide from enemies? There is one queer thing about Mother Nature, she gives all her children the best devices she can to save them from their enemies; but at the same time gives them sharp eyes, and teeth, and claws, to help them most effectively catch others.

The Screech Owl

By the way, in this same apple tree, out of that larger hole, higher up, a screech owl builds her nest. She, also, has a home and returns to it, year after year. Can any of you give me an imitation of their gentle, quivering, wailing call? You have all heard it, but did you ever hear a mother screech owl call to her little ones? I will tell you how I found out about that call. For years, I had been hearing a gentle, little, purring cluck near the house, often in my orchard, but never could satisfy myself as to its cause. Well, sitting on my porch one evening, I heard it and made up my mind to solve the mystery if it kept me busy all night.

The moon was high and full, the footing almost noiseless, and everything so quiet that I quickly located the clucking sounds as coming from the orchard. I came out of the birches into the wood-road, and was crossing the open field to the orchard, when something dropped with a swish and a vicious clacking near me. I jumped and saw the screech owl swoop softly up into the nearest apple tree. Instantly, she turned toward me and uttered the gentle, purring cluck that I had been guessing at for at least three years. And even while I looked at her, I saw in the tree beyond, against the moonlit sky, two round bunches, young owls, evidently the explanation of the calls. These two, and another young one, I found in the orchard the following day.

Bird Marriages

Did you know there was a good deal of human nature in birds? Yes; and talking about owls, did you know they pick their own mates and remain in loving companionship until one of them dies, or at least for years before they get a divorce? Just like folks, they select

"I SAW IN THE TREE BEYOND, TWO ROUND BUNCHES"

some place for their first nest—let us call it their first house—fix it up nice and there rear their children, but the old birds stay right along in, or near, the old home after the youngsters have gone out to make their way in the world. Some birds that feel rich enough to afford a trip to the south in winter, come back to the same place the following spring, open up the old home, put in necessary repairs of course, and take up their regular business till Jack Frost warns them it is time for their winter vacation.

I knew a married pair of Baltimore Orioles once. Mr. Oriole generally came in from the South on an earlier train than Mrs. Oriole. It was curious to see how knowingly he examined the battered remains of the old nest. Then he would set to work; a few hours later, Mrs. Oriole would get along. There were no greeting ceremonies. She would rest a little while, inspect her husband's work, and then join in as a true wife should.

The Warblers

I was just hoping we might see some warblers, and I think I saw some in these bushes. We will go over and take a closer look. Yes, there they are. Take a good look at them. These little fellows are great travelers. They have been spending the winter in Central America or perhaps South America. They are on their way—many of them—to British America. Some of them may conclude to spend the summer with us; further, some may even linger all winter, but most of them will return to the South. These before us seem to be taking their time, living off the country as they leisurely pass along. Some that started with them from the South are probably hundreds of miles further on.

You may not know it, but warblers work their way back and forth across the country by doing all sorts of good deeds for the farmer. They visit the orchard when the apple, and pear, the peach, plum, and cherry are in bloom, seeming to revel carelessly amid the sweet-scented and deliciously tinted blossoms, but never faltering in their good work. They peer into the crevices of the bark, scrutinize each leaf, and explore the very heart of the buds, to detect, drag forth, and destroy, those tiny creatures, singly insignificant, collectively a scourge, that prey upon the hopes of the fruit-grower, and which, if undisturbed, would bring his care to naught. Some warblers flit incessantly in the terminal foliage of the tallest trees; others hug close to the

scored trunks and gnarled boughs of the forest kings; some peep from the thicket, the coppice, the impenetrable mantle of shrubbery that decks tiny water courses, playing hide-and-seek with all comers; others, more humble still, descend to the ground, where they glide with pretty mincing steps and affected turning of the head this way and that, their delicate flesh-tinted feet just stirring the layer of withered leaves with which a past season carpeted the ground.

her nest and laid three eggs. Then, when she was away getting lunch, or making a social call before taking up her more exacting domestic duties, one of these lazy cow-birds happened along and laid her egg in the nest. When Mrs. Warbler got home, she evidently twisted her little head from side to side, and I can imagine her saying, "What in the world is this? I am sure I am not responsible for that egg!" And then probably Mr. Warbler came and a family

"WARBLERS WORK THEIR WAY BACK AND FORTH"

council was held. And this is what they decided to do. They just would not have the responsibility of bringing up a strange bird. So they went to work and built a floor over the eggs, raised their nest rim a little higher—built another story on their house, you know—and started all over again.

A Determined Pair

I will tell you about a yellow warbler's nest I once found. It told me a story of bird pluck that is deserving of a medal. Do you know what a cow-bird is? He is just about the laziest bird you ever saw. They are too lazy to make nests and sit on eggs through weary days and nights so as to have little families of their own. These trifling birds hunt up other nests, and when a good chance offers itself, lay an egg in it for the other bird to rear. They do not have the excuse of being too poor, either—it is nothing but laziness.

Well, the nest I found was a curious one. The little yellow warbler had built

A Lesson in Perseverance

And again that trifling cow-bird, probably anxious that her abandoned child should have the care of such an energetic father and mother, came and deposited a second egg, and I can imagine father and mother warbler disgusted and mad when they saw this second found-

ling egg. Probably another council was held. But they had a really choice location for their home, the view was fine, lots of choice bird food near, and so they started to add still another story to their house. They got the rim built up and the flooring laid over the second egg; but had not put in the lining to the nest that all neat bird carpenters provide, before that nuisance of a cow-bird favored them with another egg. Were the warblers discouraged? No! They acted out the old maxim, "If at first you don't succeed," etc., and put in their lining, but an extra double thick one over the obnoxious eggs, and this time they won out. I more than half believe one of them stayed close to the nest to give Mrs. Cow-Bird a surprise should she call again.

How They Saved Their Home

We have so much to see that we must hurry on, but I really must tell you how some warblers saved their home; when you hear someone saying that birds cannot think, you tell them this story:

Some years ago, a neighbor of mine was mowing a rank growth of weeds, and while thus engaged noticed a pair of little yellow warblers constantly flying around in a bunch of alders ahead of him and most excitedly chattering and calling to each other as though in trouble. Suddenly one of them flew directly in his face, snapping its bill and chirping excitedly. Not stopping his work, the mower was again and again saluted in the same manner. He finally understood that the bird's actions were in protest against his further progress. He quit mowing, and the bird flew back to the bushes. He cut another swath and brought the bird back almost at the same moment. My neighbor's curiosity was now thoroughly aroused. He walked ahead to the bushes and found a nest containing young birds. So, he kindly stopped his mowing and Mr. Warbler sang a song of thanks.

Now, we do not know just what these birds were thinking about, but it amounts to this: Mrs. Warbler, being the mother and more anxious about her children, as all mothers are, was the first to take the alarm. She probably called Mr. Warbler and said, "Just look! That big, awkward, two-legged thing we call man is cutting things down. If you don't stop him, what will become of our house? Where will the babies and I go? Do something!" And Mr. Warbler, though terribly excited, seeing that the man was so ill-mannered that he would not stop by the use of gentle means, made up his mind to use force. Of course he was small, the man large and strong; but he had wings, could move fast, and had a sharp bill, so—perhaps he chirped good-by—he made as ferocious a charge as he could and won a glorious victory.

The Spring Suit

Most birds put on a new suit in the spring. That one we just scared up is a regular dandy. He wants the best suits to be had, and he needs two of them. He is a good fellow, does a great deal of useful work for the farmers, and is a good singer. He seems proud of his name, and does not hesitate to introduce himself as Bob O. Link. Perhaps he is inclined to be selfish; at any rate his wife has to get along with one suit, the same in quality and makeup as his second one. As they are great travelers, spending the winter in the South, even going to Brazil, Mother Nature, who is their tailor, makes this later dress do for the hard, every-day working and traveling suit. It also serves for protection against their enemies. In other words, it is colored so as not to attract notice. It is composed of much streaked yellowish-brown, neutral-tinted feathers; but the spring suit that Bob puts on is a mixture of colors, jet black, white, and cream buff—not at all like the modest dress he soon dons.

How a Feather Suit is Made

We can have a suit made and put it on or off as we please, but nothing of that kind can happen with birds, and the process of getting a new feather suit is

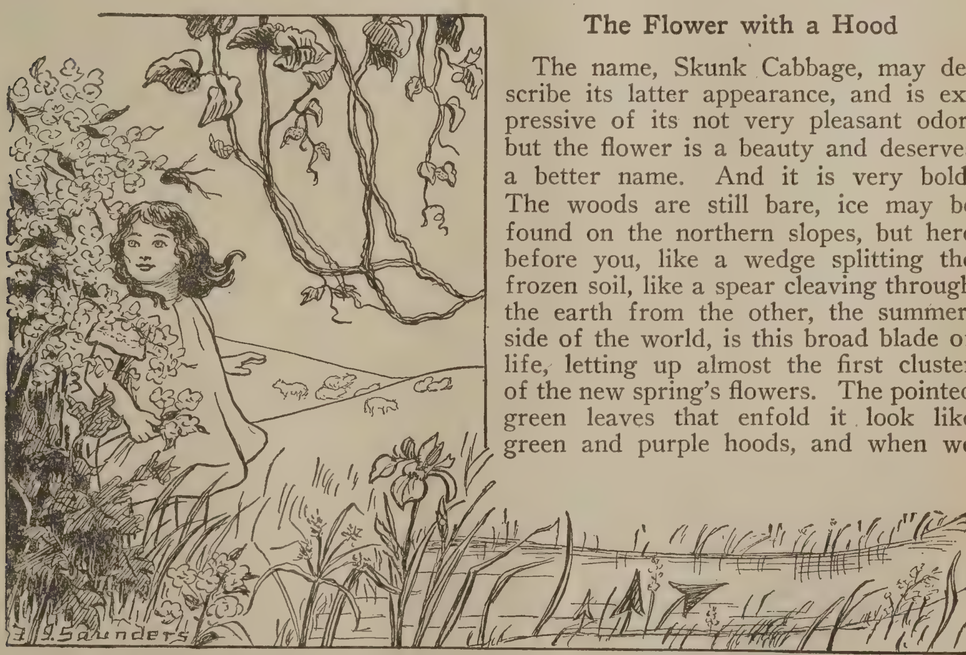
a tedious operation, not free from dangers. But Mother Nature, as is always the case, looks out for her children. Water birds can swim, you know, and so, in their case, the wing feathers drop out fast, so much so that they generally cannot fly, but they can swim all right. But birds like hawks and crows—in fact, all birds that only get around by flying—require wings in good working order all the time, so Mother Nature replaces them very slowly, one or two at a time, and at long intervals. The case is different with tail feathers, because, you know, the tail is mostly for ornament, though it also serves as a sort of rudder. Consequently, Mother Nature lets tail feathers drop out in bunches at a time. It is such little things as this that show us what wisdom (from some source) all of nature's actions display.

Spring Flowers

Now, I am sure we could talk about birds all the rest of our tramp, but that would not be fair to the spring flowers that answered the call of spring and are ready to greet us in their new suits of yellow and green. One thing you must notice at the start. The first flowers are very modest. You see, Mother Nature, in changing her robe of white for the green one of spring, does not make the change abruptly. The first flowers hide under dead leaves; they are only a few inches high and are not striking in color and do not flaunt themselves in your face; they are not near as bold as their cousins of summer that come right up to the roadside and waft their perfume to you. We will follow this lane. On one side, you note it slopes down to the creek; on the other, it is a part of a rocky, wooded hillside. Now, if spring be really here—and the frogs said it had arrived—we ought to find some flowers. As usual, you are looking way off for flowers instead of right down at your feet. Here, abloom on the edge of the creek, is a Skunk Cabbage. Better not pick it, because you cannot keep it long.

The Flower with a Hood

The name, Skunk Cabbage, may describe its latter appearance, and is expressive of its not very pleasant odor, but the flower is a beauty and deserves a better name. And it is very bold. The woods are still bare, ice may be found on the northern slopes, but here before you, like a wedge splitting the frozen soil, like a spear cleaving through the earth from the other, the summer, side of the world, is this broad blade of life, letting up almost the first cluster of the new spring's flowers. The pointed green leaves that enfold it look like green and purple hoods, and when we



"FLOWERS THAT ANSWERED THE CALL OF SPRING"

open one, there, right before our eyes, is a stalk covered with hundreds of little florets. The hood is furnished by Mother Nature to protect this adventurous collection of flowers from the cold. In a few weeks from now, if we happen here, the hood will be gone, while the great green leaves will remind us of a growing cabbage.

The Little Flowers Dressed in Fur

The Skunk Cabbage is a big fellow and has a hood to keep him warm. If you will only poke those dry leaves aside you will find some beautiful little flowers that have also ventured out. That is Hepatica, and remember the name. You see they are of different colors—white, blue, and pink. The white ones are sometimes called snow flowers. They are dear little flowers, growing up in bunches, and do not seem to be worried to find they are almost alone in the world. But—oh, yes—about that fur, Mother Nature, as usual, provides for her children. If you will just feel along the stems and under the leaves you will find a soft, woolly fuzz. It is their fur coats. They have been closely wrapped in furry leaves all winter. You might say they went to sleep last fall with their coats on, so as to get an early start.

The Wind's Playmate

I think the spring winds love all flowers, but there is one—and you will find them before long—that is called Wind Flower, which seems to be the wind's special playmate. You will note it is just one single, small blossom on top of a rather long stem. They rock to and fro in the wind. I think perhaps flowers love the wind just as much as they do the sun. The wind is so lively, it hardly keeps still a minute. Sometimes it makes sounds that are low and sweet, and it touches the flowers gently; or else it is very mischievous, tossing dead leaves in the air, and carrying the flowers' pretty leaves away. But when it is really angry, it howls and roars and bends their stems almost double. The wind, though, is very kind to the flowers. After they are wet by the rain, it blows against them and dries them quite nicely; and when their seeds are ready to be sown, the wind lifts them up and carries them off and puts them down in some little bed of earth where they can grow.

The Umbrella That Grows in the Woods

Now notice that lightly shaded place, free from underbrush, fallen leaves, of course, on the ground. Looking closely, I am sure you will see something pushing up through the leaves. You boys had better make a note of this place for those sturdy, pushing stalks are the handles of nature's little umbrellas that protect the May-apples, and you know how good they are when ripe. These plants that so vigorously push through the leaves teach us a lesson of pluck, but they also have a moral to impart. Before the frost has lost its hold upon the stout oak leaves that have lain the winter long upon the ground, that leaf-wrapped stalk pierces the thin crust. Many meet with a serious obstacle to their upward growth in the leaves upon the ground, but their progress is never wholly checked. Apparently unable to push it aside, the May-apple pierces the dead leaf, and then lifts it up, to a height of half a foot above the ground. A decided victory seems at first to have been gained, but the upward-borne leaf has its revenge. It is merely pierced, not torn asunder, and retaliates by holding the May-apple firmly bound; and the glory of its growth, the outspreading of its umbrella-leaf, is effectually prevented. The moral is: you must, through life, exhibit pluck to overcome obstacles, but be careful to avoid bad habits, or they, like those dead leaves, will hold you down and stifle your talents.

The Trees in Flower

We could walk all day and not exhaust the modest flowers of spring.

From this little hill you have a good view of the country; let us stop to rest and at the same time admire the beauty of the trees and shrubs in bloom. You see, some people that live in the city never know that great, gray looking trees are ever covered with tiny flowers; but in the country, in the spring of the year, anyone can see them thus adorned. All the little twigs have now a lively look, but by far the prettiest blossoms are hanging from the Red Maples. No one could ever count them, there are so many, and they are far too high to reach. Still, you can see that they are something like tiny crimson bells with very many yellow clappers. From a distance, they make the trees look as though pink clouds were paying them a visit.

We are fortunate in being able to stroll out this beautiful day and enjoy the magnificent panorama nature has prepared for us free of charge. The spreading, creamy flower-heads of the black-haw decorate the borders of the green lanes and the roadside thickets; while against the misty purple woodlands, other trees spread their wide, white shelves of bloom. These are the showiest blossoms of the season. Every tree has its characteristic and interesting flowers.

"THE TREES IN FLOWER"

The Oaks

Here swamp oaks tower high into the air above us; and, as our eyes penetrate the shifting, shimmering mass of bright green foliage, that, at first, is all we see. Soon, however, tossing, yellow tassels are seen, swinging from all the branches. Those minute florets clustered on slender threads are the oak-tree flowers. The scarlet oak has somewhat larger, but very similar, tassels, and as this form of blossom is characteristic of the entire family, we would do well to remember the botanical name. They are called aments. These drooping fringes veil the gnarled and twisted boughs until the oak tree seems to belie its traditional severe character, and disguises its rugged strength with trappings of fairy-like grace and beauty.

The pink and saffron coloring of this thin veil owes much to the unfolding leaves, for their satiny surfaces are flushed with orange, sienna and scarlet, and display a flower-like beauty that outrivals even the aments. Aments are the flowers that produce the pollen. There is another set of blossoms, situated in the axils of the leaves and not so easily seen, from which the acorns grow. At other times of the year, the great oaks preserve such a sombre and sternly majestic poise that this springtime transformation, this breaking forth of youthful life and beauty from the aged trunks, is most beautiful. It is a vision upon which to gaze and marvel!

Liquid Amber

When I was a boy—way down East—we had a beautiful tree that grew in swampy places like that one before you; it was called Liquid Amber. Mother Nature guards the buds through the severe winters with closely clasping scales. In the spring, these fall away, the buds slowly swell and assume the form of an upright, conical flower-cluster; while the young leaves at the base, all curled and contorted, gradually unfold and reach outward, with an abandon and careless grace most beautiful to see. Slowly the leaves broaden and as they lengthen develop a firmer texture and darker color, until the five-pointed star of the mature leaf is grown complete. While this development goes on, a rough green globe swings off on a slender stem from below and drops lower and lower until it hangs two inches or more below the leaves. In that position, it grows with swelling seeds inside, finally turns a darker green, and hangs upon the tree till autumn lets loose the seeds.

The Plant That Sets a Trap

We can find some, I am certain, if we try. Though they deliberately set traps for insects and flies, which, when once caught, they eat, just as hunters do, they bear a high-sounding name. You would not dream they are so designing in heart. The flower is called Jack-in-the-Pulpit, or the Preacher. Surely, he ought to be a model flower. First of all, two tall, large leaves come up from the ground; they are divided into three pointed leaflets. They stand straight above the flower's head, as though it were their intention to make sure it should have enough shade. Even in the thick woods where the preacher loves to grow there slips in, sometimes, warm, bright sunlight, which does not suit Jack, though from his name he ought to prefer the light. But with the two leaves flaring overhead, the flower is just as well shaded as though it had a parasol. The flower part that everyone calls the pulpit grows on a little stalk of its own that is tucked in between the leaves. It looks like a funny leaf; it is something like the hood over an old-fashioned pulpit—the kind they used to have years ago. This pulpit is green, or else green streaked with purple.

Jack the Preacher

Just inside the pulpit there is a little straight piece, and this is Jack, or the preacher, who stands in his pulpit, and those who have ears to hear receive a stirring message right from Mother Na-

ture. Now, what is very curious is that neither the pulpit nor Jack are true flowers, though there are many flowers present forming Jack's audience. The real flowers are tiny things, grouped around the feet of the preacher. In fact, they grow in the same way and are just as little seen as the flowers of the skunk cabbage. In reality these two flowers are first cousins, and in many things are alike, although skunk cabbage is coarse and has a bad odor, while Jack-in-the-pulpit, as we would expect, is a very refined flower and does not use perfume, except a trace of one that reminds you of green woods.

It seems that this floral preacher likes fresh meat for lunch. Mother Nature has so arranged matters that he has a constant supply. The tiny flowers growing in the pulpit secrete honey. Unthinking insects and flies crawl in the pulpit after the sweet juice. Like some traps for foolish men, it is easy for the insects to get it, but a different matter when they wish to leave their banquet room. They find that its inner walls are too slippery for them to climb. Then above, where the florets cluster around the preacher, it grows larger, swelling with pride, as it were, forming a ledge, which makes it impossible for small insects to get out by using their wings. Then, having trapped their game, the flowers make a square meal out of them. This is only another illustration of how Mother Nature provides for her children.

The Flower That Hides in the Ground

I am sure that you have noticed other large leaves like these the preacher sports, and if you have handled them you know they have a velvety feeling. Now, such leaves ought to have flowers. Can you find them? The next one we come to will surprise you. Ah, here are some. I will just poke around in the loose soil, and here is the flower. It is pretty dirty and is shaped something like a bell. It is another of Mother Nature's surprises. Most flowers want to show themselves; this one hides in the ground. It does not propose to run the risk of being picked. It is a real flower, just the same, and is called Wild Ginger, because its root tastes like ginger. It packs its round seed in a little box, called a capsule, and when all is ready, some sort of a spring is touched somewheres, and it explodes and throws its seeds in all directions.

The Shrubs Whose Leaves Form White Envelopes

These shrubs bloom rather late in spring, and I am afraid we will not see any this trip. But you all have seen it and will recollect its name. It is the Dogwood. You have seen them and the woods and hillsides look gay with their white blossoms, which can be seen from a long distance. But this is another of Mother Nature's jokes. These white blossoms are not flowers at all. They are simply envelopes for the real flowers, keeping them from harm, just as a real envelope protects the letter.

The true flowers are tiny green things, and we see them packed in the center of the beautiful white leaves. It is not likely that many would know about them, and certainly no one would call them beautiful, if the white envelopes did not wave so gayly, calling to hundreds of people to look their way. Insects see them as well as people, and fly up to make them a visit; they soon become acquainted with the little green flowers which otherwise they might never see.

The Flowers' Errand Boys

What do you suppose Mother Nature had in mind in giving these insignificant little flowers such a gay wrapper? The answer to that question illustrates once more the infinite variety of means Mother Nature employs to serve her ends. The fact is, flowers could not live happily and bloom as they should, if they were not visited by insects. Insects are flowers' messenger boys, carrying the golden dust which helps flowers

to form seeds. They take it from one flower to another; if it touches just the right spot, seeds soon begin to form. Sometimes the insects do not even know they are carrying the golden dust. It is light, like powder, and clings to their legs and wings. At the next flower's house they visit, they perhaps spill a little of it, and this, of course, is just what the flowers need. So, it is really to catch the insects' eyes that Mother Nature has given the plain little dogwood blossoms the beautiful white floral envelopes.

"LOOK AT THAT OLD LANE"

The Little Moving House

That! Don't you know what it is? Well, that is a snail. You have seen people moving a house, and know what hard work they make of it. This little fellow carries his house around with him. We are constantly reminded of the many different ways of achieving results that Mother Nature has at her command. We build houses; birds build nests; wood-chucks burrow in the ground; Mother Nature concluded to make the snail capable of growing his own house and carrying it on his back. In the winter time, he just gets down under the leaves, packs them around his house, curls up in it, and enjoys a good long nap.

But there are many queer things about a snail. If he is left perfectly quiet, you would see him, after a bit, coming out from his house. He comes out head first, but nearly all the part which projects is his foot. He only has one foot

and cannot walk very fast, for he has to make his road as he goes. He just secretes a little sticky juice and wriggles his foot along by its aid. You would see, near the end of the foot, his head, his stalks, or tentacles, and the little black beads at the ends, which are his eyes. So, you can say this snail carries his house with him, has one foot, and his head, mouth and eyes at the end of his foot; but his stomach, heart and lungs are safely entrenched in his house. He is perfectly harmless; suppose we let him go.

Around Our Home

I have purposely taken you home in a roundabout way. I have a reason for so doing. Stop on this hill and look at the orchards and fruit trees near your home. We have been to the woods and seen some beautiful flowers, admired some forest trees in bloom, but I am sure you will travel the woods over and not find as pleasing a sight as these trees, all billowy with blossoms. And, my little friends, let that sight engrave itself on your memory. In after years, it will be one of the pleasant things to remember. The trees in bloom, the lilacs and lawn shrubbery, the humming bees, twittering birds, your mother busy about the house, father coming in from his work, the dog that runs to meet you, the old cow that is waiting near the barn—ah, me! little folks, I know how it is going to be.

You are going out in the world; you think you are going to have so much enjoyment and win success and money—I trust you will. You have alluring pictures in mind, but, whether successful or not, wearied, probably disappointed, in after years you will recall this peaceful scene and it will be one of the green spots in the garden of youth, one that will rest your mind and banish for a moment your anxious cares. So, frame this picture and hang it on memory's wall.

The Winding Lane

Look at that old lane. The trees are flower-laden; the air is heavy with a honeyed scent; the bees' low hum fills the long, leafy arch, and every summer bird is happiest—this is an experience too much valued to be lost; it will sweeten after life. The trees are old. They have more than rounded a full half-century, and bend with the weight of many winters. They are ragged rather than rugged; yet they are sturdily holding up to the bright sunshine, this bright spring day, a marvelous wealth of bloom. Let us go near them, walk beneath and beside them, linger in their scented shade. What sound is more suggestive than the hum of those bees! As we look among the flower-laden boughs above us, we can see not only the bees from the hive, the true honey-gatherers, but burly bumblebees whizzing through the rosy labyrinths. Often in after life you will long to hear the songs, to see the bloom, to catch the fragrant breezes that now are yours.

We have now read two of Mother Nature's annual lessons, one bound in white, one in green. Two yet remain. We are not going to receive as much of value as we should unless we review each lesson, compare them one with the other. We do not want to make too hard work out of these trips, but don't you know we do not really enjoy anything that we do not work over? We want you to catch the inspiration that comes from personal interviews with Mother Nature. She communicates her most valued lessons only to those who visit her in her country home, where the trees nod to you, the winds fan your cheeks, the flowers greet you with a smile, and the birds sing in the thickets. And so, good-bye until the lesson bound in gold is ready for your inspection.

NATURE'S LESSON
Bound in Gold

Mother Nature is now well along in her regular yearly work. Fields of grain here and there are claiming as their own the gold of the sunbeams. The growing corn has put on its royal tassel, and its rustling leaves are whispering of fruitful ears. The birds that come to spend their summers with us are busy with their nests, but also with reddening cherry trees. Those that just stopped off between trains, on their way north, so to speak, have journeyed on weeks before, while the blossoms in our orchards have turned to growing fruit. With all this has come our third lesson of nature's course, the one bound all in gold. But its inner meaning is disclosed only amid proper surroundings; we will stroll out and call on Mother Nature in her summer cottage, where the views of wood and stream and waving fields commingle.

The Summer Fiddler

We must not overlook bits of story lore right at our feet. Let me introduce you to an expert fiddler. We may not value his services, but he is the performer at all insect parties held just as the sun goes down. Here comes one of these artists now. It is Mr. Grasshopper. You did not know he was a skilled performer? He does not give concerts in town, but out in the fields, along country roadsides, and, if he has an audience, it is other appreciative insects.

The delightful thing about his fiddling is that he is never obliged to take lessons, he is always in practice, and carries his fiddle wherever he goes. Near the place where the wing-covers are attached to the body there is a roughened portion on the outside, which is the string of the fiddle. There is a sharp edge on the inside of the hind legs. This is the bow. By rubbing the bow upon the string, grasshopper music is made. Some grasshoppers use the sharp, rough parts of the wing-covering as fiddle and bow. Our grasshoppers are just ordinary every-day performers. Down in South America expert players are found which are so good that people keep them in cages, as we do canaries, to enjoy their impromptu recitals. The father grasshopper is the only one in the family that fiddles. The mother grasshopper has ears wherewith to enjoy it. And where do you think these are? On her head? You are way off! They are near the middle of each of her front legs, so that, instead of turning her head to listen, she need only hold up her front leg. The ears enable her to hear many other sounds beside father hopper's fiddling, and enemies are not often able to get too near for health.

The Hopper That Sings

The musical talent of our nimble hoppers is not confined to fiddling. One

kind favors us with operatic airs—that is, grasshopper opera. To our notion the libretto is altogether too limited. It is "Katy-did, Katy-did, Katy-did. She-did, she-did." These concerts are principally given at night, but we also hear them on cloudy days. The season is not yet open, however, for the old saying is that it is just six weeks from the time of the first Katy-did concert to the first snow of the season. Some members of this interesting hopper family are known as locusts, and some locusts are great travelers. They form great armies and, like hostile invaders generally, live off the country as they journey along. In some lands the tables are turned, and they are themselves eaten. The people say they make excellent soups and stews. We will just take their word for it.

The Flying Cinderella

Of course you all know who Cinderella was. The poor little overworked girl among the pots and ashes one day and princess the next, with a gold crown and glass slippers. This gorgeous butterfly that saunters by, more brilliantly adorned than ever Solomon, is a sort of nature's parallel to that old story. You know it is the royal state of despised caterpillars, whose business in life is to eat from morning to night, and the trouble is they prefer for their regular diet rose leaves and all manner of useful, hard-working leaves. Mother Nature recompenses the caterpillar for his lowly, repulsive life as a crawler, by giving him wings and setting him free to fly a short time in the butterfly heaven. During this period of life, he sips nectar from flowers, but not for such a useful end as the busy bee who stores up honey. Are you wearing anything of silk? If you are, you are utilizing the cradle of a worm-pupa-butterfly combination which is the only honest, useful one of its kind, the silk-worm. Still Mother Nature makes butterflies do useful work in the way of carrying pollen to and from flowers, and to that degree they are deserving of praise.

The Fairies' Parasol

They are numerous in this old woods. "Oh, yes, toadstools," you say. Sure enough, but toads do not use them; so why not take another name? You know they sometimes come up in a single night. Well, why not say the fairies had a party and forgot to take their parasols with them? If this be true, fairies, like other folks, delight in variety, since there are many different kinds of fungi, which is the hard matter-of-fact name for the parasols. We find them branching like brackets from the trees, covering old stumps, or poking their dainty heads through the dead leaves at our feet. Many more may be found, by careful searching, hiding themselves behind the grasses and leaves. We may admire their exquisite forms and colors. But, however hungry, do not eat them. Some dainty forms are rank poison, and so easily are the poisonous ones mistaken for harmless kinds that you run great danger if you eat what you find before having them carefully examined.

How the Mushroom Grows

The growth of a mushroom is interesting. The first we see is the tiny button-like form pushing its head above ground. That is the parasol handle which as it grows taller, swells and expands at the top into a bulb-shaped body; and soon, on the underside, we see a break in the skin or veil. That is the fringed part of the parasol, and it is beautiful enough for any fairy. You notice Mother Nature has allowed them to accept a different method of work. They have no green leaf and none of that wonderful coloring matter, which you know is the plant laboratory for manufacturing food from air and water. So they have to live on the food of other plants. You see how they do it for they grow from trees, logs, anything from which they can extract the necessary food. Many forms look like flowers and are just as beautiful. You must notice that these parasols often are arranged in

a large circle. The easiest way to explain this is that the fairies set around in a circle; but cold blooded scholars have no use for fairies and so explain it by saying that their food is not very abundant and only the seeds that fall away from the original plant can make a living. So the ring always widens out. When you get older you will learn that the yeast your mother uses in making her bread is a very small cousin to these fairy forms.

"NATURES COILED FLORAL SPRING"

Mother Nature's Draperies

You notice that we can hardly find an old log but Mother Nature has thrown a beautiful green mat over large parts of it, also around old stumps and exposed roots, wherever there is a naked place, Mother Nature has furnished a covering. We call it moss. We find moss at all seasons of the year, but take a good look at the moss we meet on this ramble, for we may find Mother Nature just weaving an addition to the mat. Let us see how her loom works. She wants her moss children to stay with and, in fact, to form a part of the mother plant. So they grow right out of the sides of the mother plant. All form a contented, very compact family, a sort of embroidered doily. It is the children of these children, so grandchildren of the mother plant, that are able to set up a house of their own. It is in this way that Mother Nature forms a good thick mat, or piece of drapery, wherewith to cover unsightly remnants. These more vigorous grandchildren commenced their career in the summer months. Their fathers and mothers who started on their life of usefulness early, when the weather was not so pleasant, may thus be partially excused for staying so close to their parent body. You will miss one of the main objects of these rambles if you fail to notice the infinite variations in procedure Mother Nature employs in both the animal and plant world to accomplish the object in view.

Nature's Coiled Floral Spring

Mother Nature seems determined to use all her earth surface for some form of plant growth, and we have noticed some of the curious forms of which she makes use. But right around us, in the underbrush, up the hillside, along the little creek, we see dozens of her strange forms. You know what they are in a general way—they are ferns. The kinds your mother has at home among her house plants are near relatives to these wild ferns. I will tell you an interesting fact about ferns. Ferns that grow to-day are sort of nature's left-overs. Ages ago, when the earth was not suited for animal life, nature made use of ferns to take the gases out of the air. They were in their glory then. Little ferns now only a few inches in height then grew to be great trees. But as time passed Mother Nature made use of the flowering plants and plants built on a different plan, so ferns have been put in the background. They are only found in partially cleared land on hillsides and land not very fer-

tile. Look at those leaves (fern leaves are called fronds). Do you note how each growing part is like a coiled spring slowly unwinding? It is as if in those early days the flowers feared a surprise and so only uncoiled as safety seemed assured.

The Persevering Ferns

Other distinguishing traits of the hardy pioneers survive. Flowers, like boys and girls, are distinguished by different traits of character. Ferns are to be commended for their perseverance; when they find a good place they stay there, no matter how discouraging the surroundings become. Of course, they suffer in quality, the growth is stunted, the fronds are less relaxed and spreading. Where we are standing was once a wood, but now you see it is a spongy meadow opened to the blaze of the sun. Out in this open place are masses of brakes, cinnamon, and royal ferns, still growing bravely, even though their seared tops are constantly drying away and calling upon the roots for renewal. Ferns are flowers not afraid to rough it. They decorate decayed tree trunks and gather about the hollows between rocks, every fox-lair in their line of march is changed to a fairy grotto, and thus the every-day woods become enchanted forests of Romance Land.

We will go down to the creek, or, rather, to the banks of the old mill pond. It is full now, but some years ago the dam broke and left only a wide mud flat. I will tell you about some animal sights I saw. Of course, there are muskrats hiding in it. That gave me a chance to examine their homes, and I discovered they are as fond of ordinary clams as we are of oysters, and near their burrows I found piles of shells, sometimes a bushel or more. Such piles were advertisements of a muskrat restaurant. Collecting the mussels from the river bottom, the frisky rat climbs on a log or exposed stone, sits on his haunches like a squirrel, and opens the shell as cleverly as the squirrel does a nut.

The Turtles Change Their Camp

The turtles also had been driven to a new home. I knew there were many turtles, ordinarily, in the pond, but what had become of them? I prodded the ground near the little pools that still remained but no turtle invited me to come in. I noticed their tracks leading to the shore, but no turtles were waiting for me. An old farmer helped me out. He told me they had "wobbled" over the hill to a ditch in his meadow and there I found them by the dozens, all homesick. They seemed glad to see me, perhaps trusting I brought news that the pond had resumed business.

I had found the turtles all right, but along with them was one of the puzzling questions Mother Nature constantly presents for solution. Why had the turtles come to this ditch? How did they know about it? There was plenty of soft mud in the old pond and low pools of water, also pools along the bank. Why did they not stay there? To get to the ditch they had to take a walk of at least a quarter of a mile; they had to climb a hill a hundred feet in height. If only one had made the journey it would not have been strange, but apparently all of the turtles in the old pond made the trip. What instinct led them to this cool ditch through which a tiny stream of water trickled? It was a good place for them, but how did they know about it? If we will only stop, look, listen, we will find such puzzling questions everywhere.

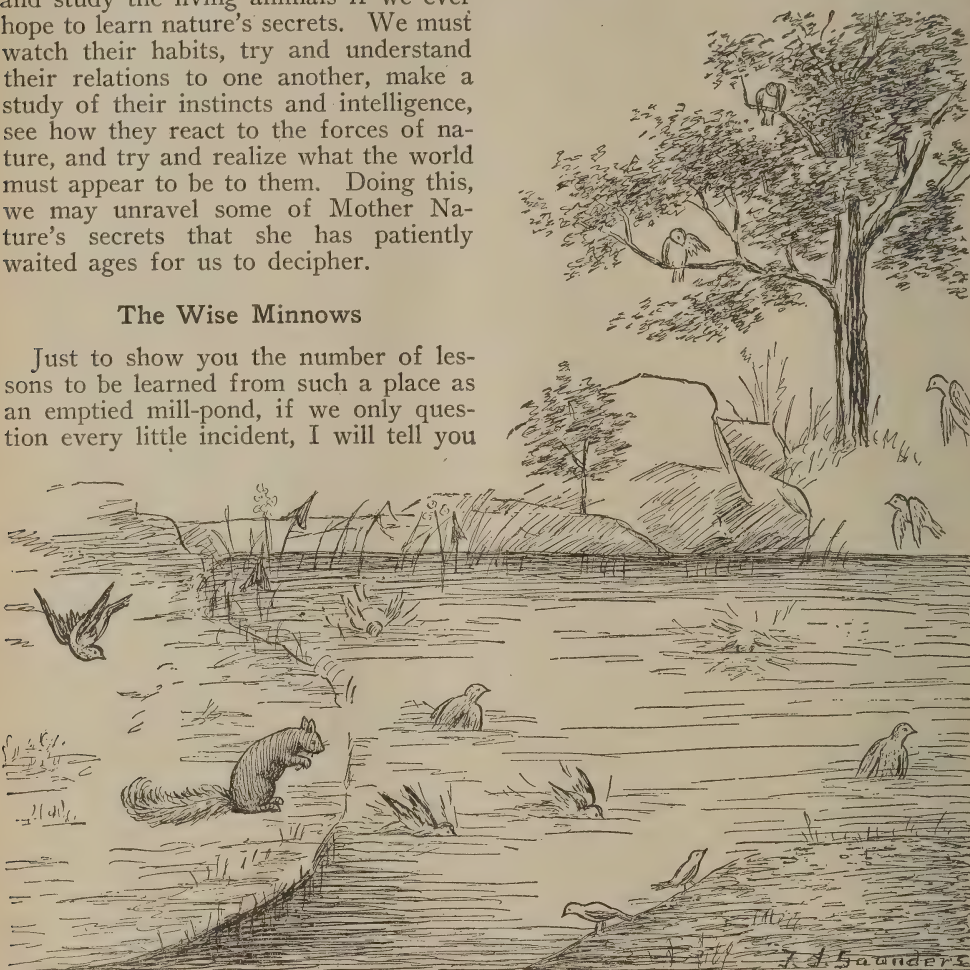
The Animals' World

Do you know that the world which we see around us may be vastly different to animals? We have five senses and you all know what they are. Now, does anyone know that animals do not have different senses? We can hear certain sounds because our ears take notice of them; it may be animals are different. The same about sight. To them, the air may be full of music that we cannot hear, of color that we cannot see, of sensations that we cannot con-

ceive, perhaps as different from ours as sound is from sight. This is the reason why we must walk out into the fields and forests and along the streams' sides and study the living animals if we ever hope to learn nature's secrets. We must watch their habits, try and understand their relations to one another, make a study of their instincts and intelligence, see how they react to the forces of nature, and try and realize what the world must appear to be to them. Doing this, we may unravel some of Mother Nature's secrets that she has patiently waited ages for us to decipher.

The Wise Minnows

Just to show you the number of lessons to be learned from such a place as an emptied mill-pond, if we only question every little incident, I will tell you about some wise minnows. Minnows are small, and probably are not learned above other fishes. I noticed some of them huddled together in a little puddle on the surface. Now, when I came near and my shadow fell on the water, the little fellows darted into the most inaccessible nook of their contracted home, and hid as best they could until I retreated some distance away. But while standing at a short distance some cows passed along near the pool, fully as close as I had been, and the minnows, instead of fearing them, seemed to enjoy their society, which perhaps broke the monotony of life.



"WE MUST WATCH THEIR HABITS"

Taking the hint, I tried to walk as unconcernedly and cowlike as possible past the pool. It was of no use, the minute my shadow fell on the pool away they darted. Now, how did they know the difference? Was it the sense of sight,

hearing, smell, or perhaps something different?

The Cautious Birds

You must notice that scarecrow in the corn field, on the hillside. It is placed there to keep the birds out of the corn. If you happen out here early in the morning it is likely you will see a crow sentinel on watch right on top of the dummy figure. They seem to know perfectly well that it is a fraud. Let me tell you about my experiments. I took a large poster and cut away all portions by the outlines of a large cat and placed it in a tree. The birds took the alarm at once. They gathered around at a safe distance and discussed the matter. It was only after considerable time during which it had remained motionless, that the excitement died down. I varnished the drawing of a large pike and placed it in a commanding position in a brook. The minnows immediately fled, but after some time they all seemed to recognize it was a fraud.

A Summer's Day Schedule

We have arrived in the woods just as the morning festival of song has died down and the serious business of bird life has begun. If you want a front seat at the regular morning concert, you must get up early; in fact, the early hours that birds keep discourage all except ardent students of Mother Nature. You must be out long before dawn proper. I was a guest at such a concert recently, and I occupied a reserved seat, as early as half-past three in the morning, but the days were then at their longest. This was the program: The wood-pewees were the first to sing, then the robins, these were followed by house-wrens, the song-thrush coming to time, a tuneful fourth, and not until broad daylight did the dozen or more songsters that frequent my back yard join in the concert. But when they did, the volume of sound was wonderful; and it steadily increased until the sun was fairly above the horizon, and then gradually died away. By five a. m. the woods were comparatively silent, and two hours later still to a marked degree. What is heard then is an almost ceaseless chirping, and the business of the day—feeding and giving lessons to young birds—has commenced. Sounds like insect-humming, that scarcely break the silence, of course continue and increase in volume as the noontide approaches; but, however shrill these may be, all other sounds are heard through them. Even the harvest-flies—be they ever so noisy—do not drown all birds.

My Armchair in a Tree

You want to know where my reserved seat was? Come this way and I will show it to you. See that steep terrace? And right in the front of it three beeches so close together their branches interlace? The hillside is so steep that you can actually step into the big tree, but when you look outward you also look downward. And there are a thicket and forest of small trees fifty feet below, while beyond all are the wide meadow and winding river. It makes one shudder to think of such a tree losing its hold, for the crash would be terrific, but there is no danger. Trees such as this have roots to correspond with their skyward growth. And those trees have probably stood there—well, ever since Columbus made his important voyage, and you know how long ago that was.

Well, those interlaced branches afford an incomparable resting-place, with a sloping back and arms of equal comfort and greater security than most modern furniture affords. There is no creaking of loose joints nor danger of collisions with other chairs. Hercules himself could not rock over in this easy chair. A few bits of coarse bagging nailed from limb to limb smooth away all asperities, and luxury in its truest sense awaits you.

My Bird Friend

I often stop and rest in my chair. I noticed a bird's nest high up among the branches gently swaying with the breezes. From my seat among the larger branches

I can see the sitting bird plainly, and it often—so I think—eyes me with a deal of curiosity in its countenance. At first it was evidently afraid. Probably it was wondering whether I was a big hawk or not. But finally it ceased being afraid and condescended to cultivate my acquaintance. I noticed that no sooner had the bird left its nest than it hopped to within three feet of me, and while preening its feathers looked at me with an inquiring gaze. Whether satisfied or not, I do not know, but soon it fell to singing and fly-catching, threading the maze of branches high overhead, but often coming back to its perch just in front of me. Perhaps it thought as long as I remained where I was the nest and its contents were safe. But why not indulge in a more romantic thought? Why not say that my little feathered friend, after due investigation, decided that I was all right? Possibly he will soon venture on still closer acquaintance, and who knows? Maybe he will politely offer me a worm as a pledge of friendship.

"I WILL TELL YOU ABOUT A GREAT BIRD BATTLE"

Youngsters Lazy and Energetic

I have learned many bird lessons from my chair in the beech tree. One is that young birds vary in ability to get along in the world. Just like boys, you know. Some boys want to get out and to work on their own hook, really before they ought to, while others want to have a good time and shirk all work. Birds are the same. A little quail no sooner gets out of his shell, draws a good breath and stretches himself than he is ready for business. Not so with all birds. I watched a young nuthatch that struck me as a lazy specimen. Not a morsel did it find, or expect to, I take it, for it never ceased a most doleful chirping, which touched the heart of his energetic mother, who fed it continually with white, waxy grubs delved from hidden crannies in the bark. Whither the old bird flew, the youngster followed, and the call of the former was always echoed by the querulous cry of the fledgling. If other birds came near, it flew to the branch whereon its parent happened to be at the moment, and begged protection with trailing, trembling wings.

Some birds feed their young when the latter are fully grown and strong upon the wing. Last summer I saw a brood of pewees fed at times, by their parents, after a second brood was hatched and constantly clamoring for food. Busier birds than these poor parents I never saw; yet they accepted the situation with apparent cheerfulness.

When Birds Fight

You know that some birds are ready to fight at the drop of a hat. Our everyday chippies seem to enjoy a good scrap

most any time. But birds get mad, just the same as boys, and the most timid ones become little furies. All birds are ready to defend their nests and little ones against all comers—often those much stronger, naturally, than themselves. What bird can be less suggestive of cruelty than the turtle-dove!—yet I have seen a pair of these birds attack and kill a whole brood of redstarts that, leaving their nest too soon, rested upon a branch close to the dove's nest. Quails in early summer will devour the eggs and young of song-sparrows and bay-winged buntings. I once witnessed a long combat between a quail and a brown thrush; the former raided the nest of the latter. The quail endeavored to avoid the attacks of the thrush by dodging among the thick weeds, but was not always successful. The thrush made downward swoops, as a hawk would, and appeared to use both beak and claws to advantage. The quail was ultimately forced to retreat.

A Bird Battle

And now I will tell you about a great bird battle I witnessed between a pair of bluebirds and a pair of fly-catchers that were stronger and bigger than the bluebirds. By chance they had chosen hollows in adjacent apple trees for their nests, and so were brought daily into more or less close association. So far as I could see, all went well. The fly-catchers hawked for insects among the tree-tops; the bluebirds were content with worms from near the ground. But by and by the eggs of the bluebirds were hatched—at least, I assumed that they were—and at that time the young of the fly-catchers were well-nigh grown. Before sunrise one morning, when the bluebirds were happier than usual, there arose a clatter in the lane, such as I have seldom heard among birds.

Every robin stopped singing; the wrens forgot their broods, orioles screeched, and every cat-bird bawled "Murder! Murder!" without knowing what the trouble was. Even the poultry took up the cry, and for many minutes that quiet, shady lane, ordinarily the very picture of peace, was an actual pandemonium. It did not take many minutes to fathom the mystery. While every bird present was thoroughly excited, there were four upon which my attention was at once centered. Brave as lions, the bluebirds, little furies now, hurled themselves against the fly-catchers, which, although stronger, could not withstand them. Vainly they attempted to dodge their pursuers, but the bluebirds were armed with strength, courage, and endurance I never supposed them to possess; they drove the fly-catchers far afield and kept them there.

Brave But Mistaken

I ought to tell you of a trick I played upon some friendly, sociable bird callers one day. It was in August when their regular work of raising youngsters was over, and they were just having a sort of bird picnic before leaving for the South. They chose for their picnic place a sort of little island in a marsh, where I had gone to spend the afternoon hunting bugs and other forms of life. I was charmed to receive this call, and we were getting along just fine. They were busy in the reeds and bushes, and I was enjoying their friendly twitter from the shade of a little tree. It occurred to me to imitate the cry of a young bird in distress. Immediately a cat-bird shrieked its alarm cry and came near me. It located the sound I had made and berated me soundly for supposed cruelty. I was harrassing a young bird, it thought. That must stop at once! The marsh wrens were up in arms but held aloof; the swamp sparrows twittered excitedly; bravest of all was a cat-bird. When most demonstrative it took up a position directly in front of me, but was silent. Evidently, he was studying over the situation. Perhaps he recalled that there were no young birds then. Perhaps he recognized me as an old friend, that in a blundering, silly way thought to play them a practical joke; finally, he chattered forth some sort of a verdict. I

trust it was on the whole one that exonerated me, though he may have reproved my thoughtless deed. At any rate, the birds resumed their social visits, and I, feeling their rebuke, kept silent.

The Ghost in the Woods

It is almost time for us to leave the woods but, before saying good-bye, I want you to sense the pleasures of a summer day in the deep forest. Go close to the earth and smell its spiciness. Rest the body and travel with the mind. The restless push of spring has passed. You no longer fear that some long-sought flower picture of the season's moving panorama will slip by unseen. The white flower-balls of the four-leaved milkweed close at hand whisper of the sun-hot fields where summer is holding its flower dance in open revelry—Mother Nature's artists making use of all combinations of colors for the curtaining, and here in the very heart of the woods is a flower that Mother Nature may have made to scare fairies. You see, it has no leaves, only scales and stalk, all staring white. You will agree that its name, Ghost Flower, is not inappropriate, and in the old days when, if ever, fairies danced in the woods they may have been so terrified by this apparition that they forsook the woods altogether.

A Treacherous Hostess

Along this old road and over in that pasture are to be found flowers that act in a very treacherous manner towards some insect callers. Yes, it is our milkweed. You boys have all caught bumblebees in its pods in the fall. The flower is now in blossom, and if you will stop and examine them I am sure you will agree that behind a smiling welcome is hidden a deep laid scheme, threatening the welfare of some insects that venture to light on it for honey. You will find honey-bees and feeble moths hanging by a foot that was given such an energetic clasp that it cannot get loose.

You see, Mother Nature so constitutes her floral children that they need the assistance of bees, moths and other insects in exchanging their pollen, which is a necessary process if the flowers are to be vigorous and healthy. But flowers prefer steady company and so they are not at home to all insects that seek the honey they have to give in exchange for the messenger-boy service in carrying pollen to and from the flowers; and you can see this is a necessary arrangement, since any one flower cares to exchange its pollen with another of the same kind only, so, of course, they must both have the same insect callers.

Our milkweed has accordingly adapted itself to serve as host to the bumblebees. They are big and strong and can survive the hearty handclasp with which they are welcomed. The limbs of Mr. Bee when he lights on the flower are affectionately seized by it and he can release them only by scraping off some of the pollen which he unloads on the next milkweed he calls on. But feeble moths and honey bees are clasped so firmly they do not have strength enough to release themselves, so there they hang, a warning to other unbidden guests to keep away, as this flower is Mr. Bumblebee's especial friend.

Nature the Greatest Artist

Leaving the woods at this point, we must take our homeward way. We have been visiting nature in her more secluded resorts, and talked about the lessons to be drawn from the forms of life there present and incidents connected therewith. Now, on our way home we must notice the fields of waving wheat and other summer grain, the corn fields and orchards. On our last ramble, we paused at this point to note the orchards and lawn shrubbery in bloom. I am sure you can recall the beautiful picture. That spring scene has now been replaced by fields fast turning yellow for the harvest of tasseled corn and ripening fruits. In years to come it may be your lot to admire the world's master-

pieces, collected in famous galleries. If an artist could faithfully reproduce on canvas the scene before you, the world would resound with his praise.

Mother Nature's Ailing Children

I think it is an appropriate time to talk about various diseases that attack our useful plants. I have called your attention to the fact that plants and animals—in fact, all forms of life—have much in common. We need not, then, be surprised to learn that flowers and trees and all forms of plant life are exposed to diseases, the same as animals. A plant which grows in a soil suitable for its needs, and which also gets as much water and sunshine as it needs usually does not become sick, for it is strong enough to resist its enemies. But if, for any reason, the food or the surroundings of the plant are not suited to its needs, or if it is cut or bruised in any way, then that plant becomes weakened, so that sickness and even death may follow.

The Sick Trees

You notice the leaves on this wild cherry tree are turning brown. The tree is sick. You notice the same thing in some of your pear trees. Now a great many fevers and other diseases from which we suffer are caused by germs. In the case of these sick trees it is the same general cause—bacteria attach themselves to the twigs, leaves, flowers, stems or fruit of plants. Even apple, pear, plum, and quince trees suffer from bacteria. They poison the leaves of the trees so that they shrivel and die; and they also injure the fruit so that it cannot be eaten. The bacteria which cause the disease live through the winter in sores or cankers that they make on the trunks of trees. In the spring, milky, sticky drops full of bacteria ooze out from these sores. Bees and flies carry the bacteria from the sores to the flowers or growing tips of other trees. Here the bacteria feed and grow and in a week or two all the trees on which they have been placed are sick and their leaves, flowers, or fruit turn brown.

"THE RIPENING FRUITS OF SUMMER"

Sick Corn and Wheat

Some of the wheat in the field before us is rusting, as the farmers say. That is, some of the leaves and stems have yellow or red spots and streaks upon

them. And near that low place where the ground is too damp in the corn field, I am sure you will find some ears of corn that are smutted. Those plants are sick and the trouble is caused by a minute parasite plant. You must recall the fairies' parasols which we found in the woods. You know it lived by getting its food from other plants. All plants which live upon or within some other living plant are called parasites. They cannot make their own food but have to steal it from other plants. The rusts and smuts are very small parasite plants. The spores of these plants are carried by the wind, or by insects, to various plants, and once on the leaves, buds, or fruit of green plants, they grow and make their way inside, where they live until the leaves may wither and die or the fruit shrivels and falls off. When all the leaves are gone, the plant can no longer make food for itself, so it dies. Damage amounting to a great many millions of dollars is caused every year by these diseases.

Insect War

Did you know that the plant world is the battle ground of the insect world? Plants, as we have just seen, cannot well get along without insects. But the insect world is divided into two great armies of friendly and hostile insects. The hostile ones, such as plant lice, chinch bugs, potato beetles, scale insects, and locusts, are the cause of immense numbers of plant diseases. The young of moths, of flies, and of various beetles also cause much damage. They suck the juices of the plants they feed upon and destroy wheat, fruit trees, roses, and pears. Other insects attack forest trees, grapevines, strawberries, and shrubs.

Desirable Immigrants

We have but recently taken the hint nature has been giving us. She evidently believes in fighting fire with fire, and whenever any of her little insect children get too active an opposing force appears to even up matters. We have learned to help nature in the process. This co-operation is so important that our government helps. A few years ago the orange trees in California were in danger of destruction from a scale insect. Our government sent abroad and welcomed to our shores a vigorous colony of other parasites that delighted in feeding on the obnoxious scale. You know what alfalfa clover is? It is a most valuable clover crop, especially in the West. It really seemed as if it were doomed by a small weevil that made itself at home in the alfalfa fields. So the government sent agents to Italy to get a supply of a very minute parasite, with a very long name, but a really wonderful appetite for the weevil. These desirable immigrants were welcomed in the alfalfa fields, and the weevil ceased to molest or to make afraid.

Nature's Lessons

I trust you have enjoyed this ramble, this visit with Mother Nature in her summer garb, and will henceforth bear in mind the lesson bound in gold. We have now read three of her course of lessons. It is not too early to draw one important conclusion which, if you will only keep in mind, will serve as a sort of mental cornerstone on which to base much future knowledge. Advance in knowledge of any kind, whichever kingdom of nature you have in mind, whether animal, plant or mineral, whether in knowledge of man or the stars, of the infinitesimally small or the infinitely great, is best won by a faithful study of what you see around. Do not try to remember all that you may read in books, but make your own researches. Study the flowers that bloom around you, the birds that nest in your yard, the animals that eye you from a distance. Every day comes to you with a lesson. It is yours to question, to determine a solution, to apply the moral. In every field of learning dare to be independent, reflect that no one has exhausted all of nature's secrets, that very little is settled beyond dispute, that infinite stores of knowledge await more persistent students.

NATURE'S LESSON
Bound in Brown

How long does it seem to you since we took our winter ramble and read nature's lesson bound in white? I will tell you a secret that every passing year will make more real to you. The years will seem to pass more and more rapidly as you leave childhood and youth behind. To me, it seems a very short time since we began these walks. But now we are in the last quarter of the year. Since our winter walk, the marvelous round of annual life has almost run its course. Once more nature is donning her quieter robes of brown. The perfume of autumn is in the air and already our birds are restless; they hear the call of the South.

And so we will take our last stroll of the year. For various reasons, we have waited until Jack Frost has made his first real visit, not just simply a preliminary, formal call, but one that paints the leaves and opens the burrs, one that starts the squirrels on a more vigorous search for nuts to increase their winter stores and incites the bees to a more diligent search for late flowers before their year's work is over.

Nature's Spinner

Right at our start, from this point where we have a good view of the roadside and the adjoining pasture, you see the silken tents of spiders. Of course, they are with us the year through, but not until autumn has come with its first frost are we so impressed with their number. Mother Nature has seen fit to scatter hosts of them everywhere. We note their webs, disclosed by the minute beads of mist caught by the delicate threads, literally covering the low herbage. Turning the eyes to bushes and trees, the branches, twigs and leaves are seen to be meshed with spinning work. In short, the whole landscape is overspread with their tents.

Spiders happen to be a form of insect life from which most boys and girls shrink, and we charge them with all sorts of disagreeable traits of character. This is nearly all owing to the fact that we are not well acquainted with them. Like all of nature's children, they will stand acquaintance, and we discover they are harmless, serviceable little workers, some of whom are dressed in all sorts of gay colors. In truth, some spider species rival butterflies and beetles in brilliancy of color. Delicate greens, pink, ruby, scarlet, orange, yellow, brown, gray, and metallic hues, silver and green especially, abound. The gayly adorned spiders form one of Mother Nature's methods of enlivening our surroundings.

Our Insect Allies

Most spiders are perfectly harmless; the common house-fly is far more to be dreaded. But they have a credit balance in nature's account with them. In fields and groves, orchards and outhouses they are not only absolutely harmless, but are engaged in ceaseless

warfare upon the enemies of man's prosperity, comfort, and health. Their chief food is insects, and day and night they pursue that function which nature has assigned them, and keep in check the myriads of insects that otherwise would overwhelm us. It is doubtful if civilized man could successfully cultivate or even inhabit the earth if it were not for these despised benefactors, unless nature were to provide some other agency to hold even the balance of helpful and harmful life. Even when spiders enter our homes and spin their cobwebs on our porches, in our halls and chambers, they come upon the wholesome errand of clearing our premises of irritating and dangerous guests. You did not know that these humble little spinners were such valuable allies, did you?

My Spider Friend

In my summer cottage I noticed a gray, determined looking spider that had made a complicated nest near my table. I concluded to form his acquaintance. I called him Jack. He was wild at first and retreated to his inmost parlor when I came near. I began by offering him flies impaled on a broom straw. It was a week or ten days before he would venture out if there was a light in the room. Finally, he condescended to accept them any time I offered them, provided I was alone. Then I gradually shortened the splint until he would accept them from my fingers. It ended by Jack getting so tame that he would come when I called him, and climb on the table for the flies I had prepared for him.

Our National Flower

The flowers of spring and summer may be fragrant and showy, but in the meadow yonder, not less than along this roadway, we see the flower our country has decided to adopt as the National Flower. It is wearing its golden crown. I am sure you all know its name, Golden Rod. It is a princess royal of the reigning family of early autumn. Yes, indeed, Mother Nature has organized her floral kingdom and appointed the Composite family to rule her more lowly subjects. Every country cross-road conducts us to their court, which is fully organized. We are even now in the throne room. Look around you. Muscular Joe Pye takes his place as chamberlain, with Boneset for court physician, Black-eyed Susan—jolly though not in her first youth — for lady-in-waiting; Dan De Lion, scattering golden coins upon the grass, as chief almoner; Iron-

"OUR NATIONAL FLOWER WEARING ITS GOLDEN CROWN"

weed for armorer, and Fragrance Everlasting as perfumer; and her Giant Wild Sunflower is king and reigns majestically, holding his head high above his tallest subjects as he watches his progeny crowding every bit of hospitable ground far and wide in the meadows, even venturing to dispute our way along this road. Our national floral ruler, Princess Golden Rod, seems to recognize us as her subjects and smiles her greeting from where she stands in royal robes, in field and swamp, crowding close to the wheel-tracks or climbing to the tops of gravel banks where little else can find

footing. She democratically joins the wayside crowd or gathers in more exclusive groups that peep from the woods and carry gleams of sunlight along the swamp edges where the stately cat-tail serves as a flag.

Jamestown Settler

Here is a flower that ought to be called an F. F. V. flower, since it came with the first settlers to Virginia, but which has fallen from his high estate, and is called the Jimpson weed, but in early days it was the Jamestown flower. And this illustrates how plants become weeds, or flowers, as they improve or otherwise on acquaintance. You had better not handle it too freely since it resents familiarity by poisoning you. The early settlers brought it with them to use as medicine, but that was when all sorts of bad smelling and evil tasting drinks were thought to be healthful. In this matter, as in other respects, we are learning to let Mother Nature alone. Sunshine and air, pure water and rest are the simple remedies she seems to prefer. This flower now serves as a sort of nature screen to cover up all sorts of rubbish. Dump a pile of rubbish most anywhere around here and nature will first screen it from view with this Jimpson weed, after which she will provide her moss doilies and fern draperies. Thus Mother Nature screens unsightly scenes from view and extends to us a smiling welcome.

Nature's Acrobats

What are they? Why, squirrels. At shows you have seen trained acrobats performing on the trapeze. If we will just stop to rest on this log, in all probability we will soon see a squirrel come tripping along—not on the ground. He has higher ideals than that. He travels in the tree-tops. What other animals take such risks? Leaping at dizzy heights from bending limbs to catch the tips of limbs still smaller, saving themselves again and again by the merest chance! But luck sometimes fails.

The Squirrel That Lives in the Ground

Sit perfectly still where you are, but look under that little clump of bushes. There are sharp eyes watching you. He is curious—all animals are—and now he is coming a little nearer. Do you know him? Yes, a chipmunk. Notice the streaks on his back. He is an industrious little fellow and just now he is hunting for hazel nuts to carry into his burrow. He rooms in the ground. Come with me and I will show you the opening to his apartment. That little tunnel leads to a nice, large, leaf-lined room, where Mr. Chipmunk lives and has his store. I will tell you how I learned that a chipmunk does not confine himself to a diet of nuts. One day in June I saw one eating away on a stump in my orchard. I could not imagine what kind of nuts they were, for there were none at that time, unless some soggy second-hand acorns that he might find on the ground. So I went down to investigate. What do you suppose they were? Why, June bugs. There was quite a pile of their cast-off shells. Chippie had split them open and eaten the insides.

The Squirrel That Flies

I am afraid we will not see any this time, for they are very shy. Mother Nature seems partial to air as a medium for moving around in, so birds are not the only animals that fly. Some fishes fly. I have seen whole flocks of them fly out from the crest of a wave and go perhaps a hundred feet before they would drop into the water again. Some squirrels, while they do not exactly have wings, can jump from a tree top and sail a hundred feet through the air. Down in my orchard is an old gone-to-hole apple tree and a pair of flying squirrels pre-empted a knot-hole for their summer home; there, one day, I found four little youngsters snuggled down in chestnut shredded bark while the anxious mother watched me from a high limb.

The Flying Harrow

Already the bird tourists are on their return trips from northern summer resorts to their winter quarters. Here in the woods are the returning hosts of the warblers that we welcomed in the spring. The Canadian tree sparrows are with us again. Some of them may stay through the winter. Did any of you hear the honk-honk-honk of a flock of

"THE TRAILING HARROW IN THE SKY"

wild geese going south this morning? If you had been with me, you would have seen their harrow in the sky. They do not fly in a bunch like black-birds, but they believe in order. A strong-winged Mr. Gander leads the way. Spreading out behind him is an unbalanced letter V, one leg much shorter than the other. Those birds have come from the far North and are on their way to the Carolina coast. They are retreating before the oncoming winter. Behind them, the forest will be bare, the meadows brown, the little creeks ice rimmed. Those to be seen now are but a remnant of the hosts that formerly flew to and fro with the changing seasons. I remember, as a boy, the passing of such numerous flocks that you needed but to glance up most any time of the day to see these trailing harrows in the sky. Did you know that our national government has set aside a great reservation, many thousand acres in extent, in Alaska, to be reserved forever as a home for migrating geese, ducks and water fowl? It is their home and Uncle Sam is ready to punish all trespassers on their rights.

The Crows and the Eagle

You hear the petulant cawing of the crows. They live in those woods the year around. They are generally given credit for being the wisest of all things that fly. Hearing them and seeing that pin oak in the meadow reminds me of a crow story I must tell you. The tree, as you note, is a grand old fellow and overlooks the rather marshy meadow the other side of the creeks. The crows for miles around have selected that tree as their roosting place. Well, one day an eagle stopped to rest in the tree. Of course, it is only very rarely that an eagle visits these sections, and even the wise crows did not recognize their royal caller. Naturally, they objected to his presence in their tree. He was too big for any one crow to think of tackling, so they called in all their forces. They even enlisted the help of some kingbirds and they began a determined drive on Mr. Eagle. One would rush in and give his tail feathers a yank, the kingbirds would pounce down on his back. The eagle quickly concluded the best thing he could do was to retreat to his second line of trenches—in other words fly up so high that the other birds would not dare follow. You should have heard the crows talking it over after their victory.

Molly Cottontail

That is the society name of our bunny. You can see her scurrying away through the bushes in the sheep pasture. Bunny

accommodates himself to the country where he lives. If the winters are long and cold, he excavates his burrow; if the weather is generally mild, he just scoops out a little hole in the ground and squats there. Sometimes he seems able to bend the weeds above him into a little nest. I have actually reached over and picked them out of such nests. Molly is a fairly well formed little rodent, but out West her cousin, Jack Rabbit, is blessed with ears and legs out of all proportions. But you should see him run! I raced after one over a flat, hard, alkali plain in a high-powered automobile going sixty miles an hour, and that bounding bunch of fur-clad ears and legs enjoyed itself by kicking dust in my face all the way. Mr. Belgian Hare is a pampered relative of our hard working Molly.

The Mistaken Cat

Now you would not think Molly Cottontail could put up much of a fight, but appearances are deceiving, especially when Molly has some babies to look out for. Once I was out hunting bugs and stopped to rest on that hill yonder, when I heard a growl and a quick thud; the thud I knew was that of Mrs. Molly as she struck the earth. Investigating, I discovered a fight was on. Crouching beside the rabbit's nest was a yellow cat. He had discovered the young ones, and was making mouths at them when the mother's thump startled him. He flattened himself, with ears back, tail swelled and hair standing up along his back, as the old rabbit leaped over him. It was a glimpse of Molly's ears, as she made the jump, that I had caught.

"BACK AND FORTH, OVER AND OVER THE CAT SHE FLEW"

The cat was scared but before he got himself together Molly, with a mighty bound, was in the air again, and, as she flashed over him, she fetched him a stunning whack on the head that knocked him endwise. He was on his feet in an instant, but just in time to receive a stinging blow on the ear that sent him sprawling several feet down the hill. The rabbit seemed constantly in the air. Back and forth, over and over the cat she flew, and with every bound landed a terrific kick with her powerful hind feet that was followed by a puff of yellow fur. The cat could not stand up to that. Every particle of breath and fight was knocked out of him at about the third kick. The green light in his eyes was the light of terror. He got quickly to a bush and ran away, else I believe the old rabbit would have beaten him to death.

The Painted Forests

We have found something peculiar to each season of the year which lifted us above the petty incidents of daily life. The frosted silence of winter, the orchards of billowy blossoms in spring, the waving grain of summer. The autumn of the year is the time of painted leaves, and Jack Frost is the master workman, though they do say, nowadays, that something more than frost is necessary to make possible the brilliant coloring of the trees we see on the hillsides and along the creek. Rest yourself and study the wide flung canvas whereon nature has placed this autumn picture. The richness of color scattered along the hillside is something marvelous. When the meadows, in summer, were purple and the brookside golden, the limit of display was supposed to have been reached, but it pales before autumn's tinted leaves. If the meadows were grand in summer, the adjoining hillside is dazzling now. The little forest has caught the trick of the sunset, and glows at the season's setting with all the glory of the evening's western sky. This change is not effected over night. Like the true artist she is, Mother Nature requires time, and the colors she uses are not altogether the work of the frost. From day to day the change is apparent. A branch of maple turns to dusty gold, a solitary gum tree clothes itself in scarlet, a winding creeper is bronzed to the very tips—such bits as these, rare as gems along the pebbly shore, are commonly held to be the fruits of the first frost, and loved the more because of their rarity.

The Sunset of the Year

Generally every fruit on ripening and just before it falls acquires a bright tint. The same is true of leaves. The nourishment they then get is not so much from the ground, through their stems, as through the air. Perhaps, in some mysterious way, they take as their own the tints of the sunbeam that comes to them in the air they breathe. The glow of a sunset sky is not more significant, for at the sunset time of the year our woodland scenery lights up with parting glow of the summer sun; let us say that the change to some higher color in a leaf is an evidence that it has arrived at a late and perfect maturity, answering to the maturity of fruits. It is generally the lowest and oldest leaves which change first. But, as the perfect winged and usually bright-colored insect is short-lived, so the leaves ripen but to fall.

Isolated Details of the Scene

As a whole, let this sunset picture of the year abide in your memory. It will be another of the memory pictures of youth to which, in after years, you will again and again return. But some details I must point out. They constitute the more striking bits of scenery. Red maples are among our first trees to put on their royal robes. The strange fact is that single trees here and there are dressed in color perhaps weeks before their unobtrusive neighbors. Just what induces this partiality on the part of Mother Nature, I cannot say. Notice

that small maple, half a mile off, across the meadow, against the green wood-side. Its leaves boast a far brighter red than the blossoms of any tree in summer, and are more conspicuous. I have observed this tree several autumns, and it invariably changes earlier than its fellows, just as one tree ripens its fruit earlier than another. It might possibly serve to mark the season.

The Maple's Record

How do you know but in some strange way nature keeps a record of the yearly accomplishment of her plant children? Before continuing our ramble, let us, in fancy, read the record of that energetic little maple. It has faithfully discharged the duties of a maple, winter and summer, neglecting none of its work, but adding to its stature by a steady growth for many months, never going abroad, and is nearer heaven than it was in the spring. It has faithfully used its sap and afforded a shelter to wandering birds, has long since ripened its seeds and committed them to the winds, and has the satisfaction of knowing, perhaps, that a thousand little well-behaved maples are already settled in life, somewhere. Its leaves have been asking it from time to time, in a whisper, "When shall we redden?" And now it runs up its scarlet flag on that hillside, which shows that it has finished its summer's work before other trees, and is ready to do what it can to beautify the closing year.

How the Trees Repay the Earth

You know the autumn of the year is also called the fall. Why? Because it is at this time that grains and fruits and leaves decline and fall. It is the great harvest of the year. The trees are now repaying the earth with interest what they have taken from it. They are about to add a leaf's thickness to the depth of the soil. For beautiful variety, no crop can be compared with this. Here is not merely the plain yellow of the grains, but nearly all the colors that we know, the brightest blue not excepted. The early blushing maple, the poison sumach with its blazing leaves, the mulberry ash, the rich chrome-yellow of the poplars, the brilliant red huckleberry, with which the hills' backs are painted, like those of sheep.

Thoughts That Come

At the close of each walk, I have purposely brought you to this hill where we can survey home scenes. In every instance, we have found the view, while not, perhaps, so picturesque, more satisfying on reflection, since it suggests those things which comprise home happiness and well being. The blossoming orchards made more of an appeal to us than the glowing trees of forest, since they suggested luscious fruits of summer; the field of maturing crops, a pleasing combination of yellow and green, were more enjoyable than flower decked underwoods and meadows, they had about them a suggestion of harvest wealth and cheer. The forests are now, indeed, resplendent with autumn tints and carpeted with rugs more beautiful than the products of Oriental looms; but, in the quiet scene before us, there is a latent suggestion of the year's work well rounded, of comfort, care and plenty, of coming winter's rest that confers on it a subtle beauty that flaming forests can not equal.

The Corn in the Shock

Note the serried rows of corn shocks in the hillside lot. They are the well-arranged tents wherein rest the disciplined forces of care and plenty, warring against the forces of want. They suggest well-filled cribs and quiet scenes of country life. Decorating the field with spheres of gold and green are spreading pumpkin vines. We may not consciously realize it, but, seeing them, our stomachs remember, if we forget, the luscious pies of Thanksgiving.

The Stacks in the Field

Those hay and grain stacks in the meadows that form the bottoms along

"THE FORESTS ARE NOW RESPLENDENT WITH AUTUMN TINTS"

the creek are up-piled stores of wealth; they are dividends, declared by Mother Nature, payable out of her yearly surplus to the farmer that has faithfully toiled in her fields. That trailing banner of smoke tells us of belated threshing scenes where Mother Nature is cashing the drafts and checks of the husbandman, paying in gold, too, a greater store of wealth than mines produce.

The Orchards

Last spring, we saw the blooming trees which line that lane. In the summer they were trying to conceal behind their green leaves the growing fruit. Now, all concealment is cast aside and the boughs are bending beneath their load of fruit. Some apples, you notice, are golden, some are green, some a dark red —all pleasing, all delicious. It is rare that the summer lets an apple go without streaking or spotting it on some part of its sphere. It will have some red stains, commemorating the mornings and evenings it has witnessed; some dark and rusty blotches, in memory of the clouds and foggy, mildewy days that have passed over it; and a spacious field of green, reflecting the general face of nature—green even as the fields; or a yellow ground, which implies a milder flavor—yellow as the harvest, or russet as the hills. Did you know that apples are perhaps our most celebrated fruit? The apple is mentioned in ancient song and story; goddesses are fabled to have contended for it; dragons were set to watch it, and heroes were employed to pick it; writers of the Bible mention it, and "apples of gold in pictures of silver" is the phrase to express the acme of perfection.

How the Hedgehog Gathers Apples

Did you never hear how the hedgehog gathers apples? I will not vouch for the truth of the story, but it is an interesting one and finds a use for the hedgehog's quills. The language in which it is related is as quaint as the story itself: "When he findeth apples on the earth, he rolleth himself upon them until he have filled all his prickles and then carrieth them home to his den, never bearing above one in his mouth; and if it fortunes that one of them fall off by the way, he likewise shaketh off all the residue, and walloweth upon them afresh, until they be all settled upon his back again. So, forth he goeth, making a noise like a cart-wheel; and if he have any young ones in his nest, they pull off his load wherewithal he is loaded, eating thereof what they please, and laying up the residue for the time to come."

The Purpose of These Rambles

As this is to be our last ramble, having now taken the closing lesson in nature's annual course, I am going to play the part of teacher and give a brief valedictory talk. These rambles have not been taken for the purpose of scientific knowledge, but simply to introduce you to Mother Nature in her various seasonal homes. She has a friendly greeting for all boys and girls that visit her, desirous of learning at first hand the simple truths she has to impart. The knowledge you are to gain from more formal study of books is, of course, necessary and valuable. But you must constantly refer the information there obtained to Mother Nature, herself, for confirmation.

Become Acquainted With Nature

I want you to come to a speaking acquaintance, as it were, with the birds that nest in the trees of your orchard; how many of them do you know? How many of them are nature's birds of passage, going and returning with the seasons? What of the sparrows that scold you from the street? Where do they nest? How many of the larger birds, at home in the woods, do you know? Everywhere are opportunities for becoming acquainted with some of nature's lowlier forms. Every one has some secret to impart, if you only question it. The ant you crush beneath your feet is as worthy of study as the stately elephant in the zoo. The most of you have

a garden. It has as much knowledge to give you as you would probably gain from a trip to foreign lands. The toad that sleeps by day under your front door walk can tell you more than the wisest teacher, provided you study his lessons.

The Lessons of the Flowers

All through the year the flowers in the forests, in the fields, along the roadsides, have coyly invited you to a closer acquaintance. Can you tell their parts? Have you noticed the partnership between flowers and insects? What a fine profit sharing their industries display. Flowers secrete honey; with this they reward bees who act as their messengers in exchanging pollen. Stop at the first clover field you come to and note the mutual labor conducing to the welfare of the partners. Note the changing order of flowers through the year. The modest blossoms of spring, the more gayly decked flowers of summer, the golden crowned hosts of autumn. Every one has a pleasing story to tell you, but it is not printed for publication. It will be whispered to you in the flowers' chosen haunts.

The Closing Lesson of All

And now, my young companions, my fellow trampers, I shall be disappointed if you have failed to some way grasp and be able to retain the great lesson I have been trying to impress on you. I do not mean in a learned, scientific way, but each in his own way. In all the stories I have told you, all the rambling, almost disconnected remarks I have made, I have had, as a sort of underlying basis, one simple purpose—to impress on you the fact that Mother Nature (by which term I simply mean the collected forces that have resulted in the present conditions of this world) seems to be acting in accordance with a wisdom that works to wise ends in all things.

All human learning sums up in gaining a knowledge of nature's methods of work. There are, of course, various branches you learn in school, such as reading, writing, and spelling, not directly gained from nature. But all advance, everything that has made life better worth living, has been won by questioning nature, learning her secrets and applying the same. You will soon be old enough to take a part in this work. I trust these talks and walks have given you a hint how to start in this work. Do not rely on what others have done; see things for yourself, examine for yourself, do by yourself. That will make your own life more complete, and extend your field of usefulness.

To him, who in the love of Nature, holds
Communion with her visible forms, she speaks
A various language: for his gayer hours,
She has a voice of gladness, and a smile
And eloquence of beauty: and she glides
Into his darker musings with a mild
And gentle sympathy, that steals away
Their sharpness ere he is aware.

NATURE STUDY

THE WORLD

Great, wide, beautiful World,
With the wonderful water round you curled,
And the wonderful grass upon your breast,
World, you are wonderfully drest.

The wonderful air is over me,
And the wonderful wind is shaking the tree;
It walks on the water, and whirls the mills,
And talks to itself on the tops of the hills.

You, friendly Earth! how far do you go
With the wheat-fields that nod and the rivers that flow,
With cities and gardens, and cliffs and isles,
And people upon you for thousands of miles?

Ah, you are so great, and I am so small,
I tremble to think of you, World, at all;
And yet when I said my prayers today,
A whisper within me seemed to say:
"You are more than the Earth, though you are such a dot;
You can *love* and *think*, and the Earth cannot!"

—*Matthew Browne.*

NATURE STUDY

INTRODUCTION

Nature, the old nurse, took
The child upon her knee,
Saying, "Here is a story book
Thy Father has written for thee."
—*Longfellow.*

The Realm of Nature. The realm of nature extends from our feet to the boundaries of the universe. It is the great university of man and within it he spends his life. Neither walls nor closed doors bar our entrance, no bell disturbs the air to call us to school, nor to "sound the knell of parting day."

How many go through this universe with their eyes closed to its beauties and grandeur, pursuing their daily tasks to obtain a livelihood and amass material wealth! Not that these aims are wrong; indeed, they are necessary, but man is intended for a broader and loftier outlook as well. Without the cultivation of all his powers, he only partially lives. The study of the realm of nature, therefore, is essential to our greatest usefulness and to our happiness. That we may derive the greatest benefit from this study, it should begin in childhood.

PURPOSES

In nature study we should keep in mind the following purposes:

1. To train the powers of observation.

One of our leading psychologists tells us that of all the mental powers, the power of observation is the most difficult to cultivate after 20 years of age.

Most people go through the world blind to half its beauty and sources of happiness because their power of observation was not properly trained during childhood.

Again, it is the man of keen perceptions that becomes a leader in the progress of society. All discoverers, explorers and inventors have been men possessed of extraordinary powers of observation.

Finally, a keen observer is a clear thinker, and training the power of observation is indirectly training one to think.

No exercises are so fertile of results in securing these ends as those given to the study of simple objects of nature.

2. To make the pupil acquainted with his environment and thereby increase his resources for happiness.

Those whose early years are spent in the country are fortunate, because they live close to nature, and nature is one of the child's earliest teachers.

"Hand in hand with her he walks,
Face to face with her he talks,
Part and parcel of her joy."

Whittier in his *Barefoot Boy* says of the country boy that he knows—

How the robin feeds her young,
How the oriole's nest is hung,
Where the whitest lilies blow,
Where the freshest berries grow,
Where the ground-nut trails its vine,
Where the wood-grape's clusters shine;
Of the black wasp's cunning way,
Mason of his walls of clay,
And the architectural plans
Of gray hornet artisans.

Adjustment to his surroundings not only increases the child's happiness, but it is also a very important condition to the proper development of the emotions. The child is actuated by curiosity to examine all natural objects with which he comes in contact. As he becomes acquainted with the marvelous secrets connected with the life of common living things, curiosity leads to wonder, and wonder to reverence.

As his horizon broadens he learns that,

"There is pleasure in the pathless woods,
There is rapture on the lonely shore;

There is society where none intrudes,
By the deep sea, and music in its roar."

In the culture of the emotions we are building the positive side of character, and childhood is the best period for this work; and nature lessons, especially when combined with related literature, are the most fruitful of results. This phase of the work is much more important than the gaining of a certain amount of knowledge of the objects studied.

3. To develop interest and sympathy in living things.

Children are always interested in things that are alive, that are doing something. Because this activity in animals is more readily seen than in plants, at an early age they become interested in the cat and dog. The child, however, does not know that it hurts the cat to pull its tail, or that many other practices cause the animal to suffer, even when these acts are done to express the child's love for his pet.

During the first 12 years the child's interests are mainly self-centered, and the gratification of his desires often leads to destruction of plants and animals; if the child has been led properly to observe these objects, such destruction will never occur.

Picking wild flowers to gratify for a brief period the desire of possessing them, when, if left standing, all could enjoy them for days, is one illustration.

Another and more reprehensible practice is the wanton destruction of birds, harmless insects and small animals by boys who are actuated wholly by the desire of conquest. If the boys know the life history of these creatures and the good they do, their desire to destroy will be replaced by a desire to protect them.

"Be kind to dumb creatures,
Nor grudge them your care,
God gave them their life, and your love they must share,
And He who the sparrow's fall tenderly heeds
Will lovingly look on compassionate deeds."

4. To enable the pupil to acquire a practical knowledge of common things which will later form the foundation for the study of the various branches of natural science.

While we do not obtain too much education from books, we certainly do not obtain as much as we should from nature. Ignorance about common things is chargeable to nearly everyone. Much of this is due to neglect of the study of nature in our early years. Furthermore, the youth who enters upon the study of botany, physics, zoology or any other branch of physical science without the preliminary preparation which nature study gives is sadly handicapped. The method of securing these results is shown in the type studies in the pages that follow this introduction.

5. To lay the foundation for the study of agriculture in the common schools.

The United States has arrived at that stage of development where an increase in agricultural products is essential to national prosperity. This is fully realized by educators as well as economists, and throughout the country elementary agriculture has been added to the courses of study for the elementary schools.

Pupils cannot enter upon this subject intelligently without some knowledge of plant life, soils, weather and insects. Unless they have obtained this knowledge through nature study, preliminary lessons are necessary.

6. To establish truth and do away with superstition.

Few people realize the superstition prevalent about some of the most common things. Many do not realize that these beliefs are superstitious because they cherish them themselves.

Some of the most common superstitions concerning the objects and forces of nature are those pertaining to animals and insects, the moon and the weather.

To illustrate: A country child who has never heard these superstitions looks upon all animals as harmless. He has no more fear of a snake, unless it is of a venomous species, or of a dragon fly, than he has of birds and butterflies. He never connects the moon with the weather, nor with the planting or harvesting of crops. His observations and

experiences have not led him to cherish any of these beliefs.

All these superstitions and many others are due to ignorance or to false ideas which children acquire from those who should know better than to entertain them.

A study of the life history of common animals and insects, and even a limited understanding of the most elementary principles of meteorology, will prevent children from entertaining false ideas concerning these things.

SUGGESTIONS

Those engaged in directing work in nature study will find the following suggestions helpful:

1. Nature study means the study of natural objects, not the study of books about these objects.

2. During the first years there should be no attempt at scientific investigations. At first let the child follow his inclinations. Later direct his observations by suggestions.

3. Those who direct pupils in nature study should possess a thorough knowledge of the subject, which they have gained by personal observation and experience. The study of books alone will not prepare one to direct nature-study work successfully.

4. Exercises should be determined by the season and the locality. Many exercises suitable for summer cannot be used in winter, and in any season the material available in Maine would differ from that available in Florida.

5. The results are to be sought in the effect that the work produces upon the character and lives of the children rather than in the amount of exact knowledge they obtain.

"The result will be the introduction into life of an influence that is restful, pleasurable, stimulating and educative. Conversely, it is claimed that lives which do not include some intelligent observation of nature are denied something of the development of mind and character which life offers, and are thereby more narrow."—*Practical Nature Study.*

STUDY OF BIRDS

Birds are among the most interesting members of the animal kingdom, and they are excellent subjects for the first lessons in nature study. Bird study need not be confined to any month or season, for our feathered friends are always present. There is never a time when there are not birds to observe. Because of their sprightliness, beautiful plumage and cheery songs they always attract the attention of children, who should be led to love and protect them.

GENERAL SUGGESTIONS

The following general suggestions will be found helpful to those who wish to study birds for themselves, and also to those who direct the study of others:

1. For information which you need to hold in mind, read the article *Birds,* page 303, HOME AND SCHOOL REFERENCE WORK.

2. Become familiar with the parts of a bird. Study the diagram on page 3221, which also appears in the general article.

3. With the diagram before you, study a live bird. A canary, pigeon or chicken can be used. Locate on the bird the parts shown in the diagram. If necessary, a stuffed bird can be substituted.

4. The best part of the study is that done in the field, and any time of day is suitable; morning and early evening, however, are generally the most favorable times.

5. For field work, inconspicuous clothing, with an especial avoidance of white, aids in approaching the birds without disturbing them.

6. If in making observations the observer stands with his back to the sun, the colors are most easily and most accurately distinguished.

CLASSIFICATION

Various systems of classification of birds have been prepared by ornithologists, reference to which is given in the article *Birds.* The following tabular arrangement is excellent for popular study and its use is recommended:

- BIRDS
  - Classification
    - RUNNERS
      - Ostrich
      - Emu
      - Cassowary
    - DIVERS
      - Loon
      - Grebe
    - SWIMMERS
      - Duck
      - Goose
      - Gull
      - Cormorant
    - WADERS
      - Heron
      - Crane
      - Snipe
      - Sandpiper
    - SCRATCHERS
      - Hen
      - Turkey
      - Bobwhite
      - Ruffed Grouse
      - Dove
      - Pigeon
    - BIRDS OF PREY
      - Vulture
      - Owl
      - Eagle
      - Hawk
    - CLIMBERS
      - Woodpecker
      - Wryneck
      - Parrot
      - Flicker
    - SWIFTS
      - Whippoorwill
      - Nighthawk
      - Humming Bird
      - Swift
    - PERCHERS
      - Jay
      - Robin
      - Thrush
      - Tanager
      - Sparrow
      - (and many others)

- BIRDS
  - Description
    - SIZE
      - Humming Bird to Ostrich
    - BILL
      - Hooked—Birds of Prey
      - Short—Scratchers
      - Long—Waders
      - Flat—Swimmers
    - WINGS
    - LEGS AND FEET
      - Webbed—Swimmers
      - Long—Waders
      - Short—Perchers
    - FEATHERS
      - Color
      - Kind
    - SENSES
      - Sight—generally keen
      - Smell—acute
      - Hearing—acute
  - Habits
    - MOLTING
    - FOOD
      - Insects
      - Fish
      - Grain
      - Berries, etc.
    - SONG
    - EGGS
      - Number
      - Size
      - Color
    - NESTS
      - Location
      - Material
      - Form
    - HABITAT
    - MIGRATION
    - VALUE TO MAN
      - Plumage
      - Food
      - Clothing
      - Oil
      - Destroyers of Insects

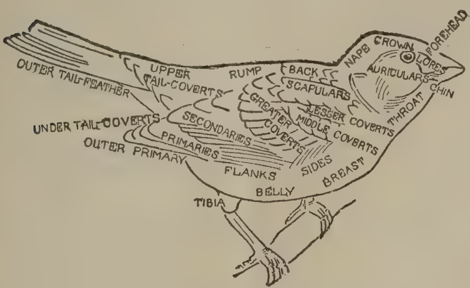
WORK FOR THE INSTRUCTOR

General Knowledge. Those who direct children in bird study should know much more about birds than they would attempt to teach the class. They should be very familiar with the appearance, song, food and nesting habits of the birds common in their locality. They should know when the birds of each species arrive in the spring and when they depart in the fall; of what benefit the birds are to the farmer; and how they may be protected from their natural enemies.

The more thoroughly acquainted the instructor is with the habits of each bird and the more interesting stories he can tell about birds, the more interest and enthusiasm he will awaken in his pupils. Therefore, he should always be on the alert daily to discover something new.

Structure. Make a study of birds for the purpose of discovering the adaptation of structure and parts to the life of the bird.

In a general way birds can be divided into two great classes, those which live upon land and those which live on the water or on both land and water. The



PARTS OF A BIRD

striking contrasts between land and water birds are brought out in the chicken and the duck.

Notice first the general shape of the bodies. How do they differ?

Compare the position of the legs on the chicken with that of those on the duck.

Which bird can run the faster? Why?

If the chicken had webbed feet, could it swim as well as the duck?

Compare the necks. Why is the duck's neck longer?

Compare the bills. Do you see the reason for the peculiar shape of the duck's bill?

The contrast between birds which live entirely on the water, except when nesting, and land birds is even greater than that between the chicken and the duck. The auks and penguins are almost helpless on land, and when sitting they rest upon the leg and tail, as shown in the cut of the great auk. The legs are so far back on the body that these birds walk in an upright position.

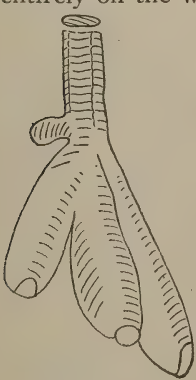


FIGURE 1

The feet, legs, bills and necks are marked features of structure and are especially adapted to the needs of the bird in the sort of life that it lives. The foot of the grebe, Figure 1, is very peculiar. The toes are only partly webbed and the nails are blunt. See GREBE.

The foot of the loon, Figure 2, is that of another diver; but the loons are better swimmers than the grebes and their feet are webbed. See LOON.

FIGURE 2

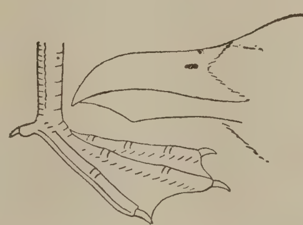


FIGURE 3

The gull, Figure 3, spends most of its life on the wing over the water. The legs are short, the feet partly webbed and the bill is short and more or less hooked. See GULL.

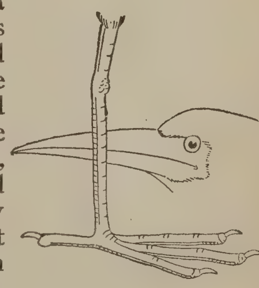


FIGURE 4

The legs and feet of the waders present a marked contrast to those of the divers and swimmers. The heron, Figure 4, has long legs and correspondingly long toes, so that its feet will form a firm support. Not only do the long toes give a firm support to the body perched upon long legs, but they also enable the bird to grasp firmly a large branch of a tree. Since it seeks its food in marshes and shallow water, its neck and bill are long. See HERON.

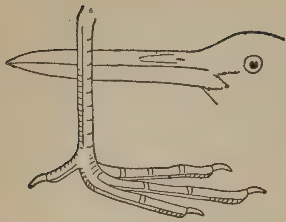


FIGURE 5

The crane, Figure 5, is also characterized by its long feet, neck and bill. See CRANE.

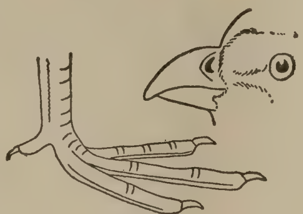


FIGURE 6

The bob-white, or quail, Figure 6, is a scratcher. The legs are short, but the toes are long and strong for the size of the bird. The legs and feet of the domestic fowl and the turkey are of this type. The bills of all scratchers are short.

The hawk, Figure 7, being a bird of prey, needs a foot that will enable it to grasp and hold the animals upon which it feeds. Notice the contrast between the foot of the hawk and those in the other illustrations. The toes are large, strong and flexible, terminating in sharp talons.

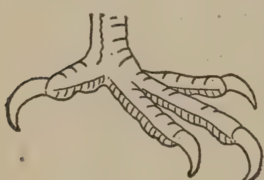


FIGURE 7

GETTING CHILDREN INTERESTED

Almost as soon as the child begins to run about on the lawn he begins to notice the birds. The first lessons he receives should lead him to love and care for the birds.

With a few suggestions and a little help he will soon learn how he can contribute towards attracting to and keeping the birds about the home.

Feeding. If crumbs or seeds are regularly placed where the birds can reach them without being disturbed, they will soon frequent the place in large numbers. In time they become so tame that one can approach quite near, provided one wears clothing of modest colors and moves slowly and quietly. From this point of observation many facts concerning the plumage, size and traits of the different birds can be learned. Often their bickerings and quarrels over the food become very amusing.

Protection. The most dangerous enemy which birds encounter about the home is the house cat. For the first few days after leaving the nest, the young of most species are nearly helpless, and many of them fall a prey to cats. By picking up young birds that have fallen upon the ground and placing them where they will be out of danger, and, if possible, where they can be fed by the parents, these young birds can be saved, and young children can be led to pick up carefully young birds when found, and take them to those who will see that they are properly cared for.

Another enemy is the boy with a sling shot or an air gun. Young children may not be able directly to prevent his depredations, but by informing their elders of his presence, they can be the means of having him excluded from the grounds. Boys who have been led to love and care for birds will not shoot them.

Water. Nothing is more effective in attracting birds than a pool of water in which they can bathe. If there is a fountain in the grounds, they will gather around every morning. If there is no fountain, a shallow pan, partially filled with water, will answer every purpose, but it should be filled daily. The pan should be placed on a support that will raise it a few feet from the ground to remove the danger from cats. As soon as the child is old enough, caring for this pan can easily be made one of his daily tasks.

Bird Homes. The same birds return year after year to those localities where

they find desirable nesting places. By constructing bird houses in trees and other places easily accessible to the birds, but free from danger, the number of birds remaining about the home can be very materially increased. While children cannot themselves construct bird houses, they take an interested part in their construction and become constant observers of their inmates.

A child left to his own devices amid such surroundings gains more valuable knowledge of bird life than his elders suspect, and when his observations are directed by an occasional suggestion, his field becomes widely extended. These unrelated facts learned in early years later become crystallized into systematic knowledge.

This line of work should appeal especially to the fathers and mothers of young children, since nothing is better than a close communion with nature to develop at an early age those desirable traits of character—love, sympathy and kindness.

PLAN FOR THE STUDY OF A BIRD

I. Description

1. Size—Compare with other birds
2. Color
   - (a) Upper parts
   - (b) Lower parts
   - (c) Head and neck
3. Song

II. Food

1. Insects
2. Small Animals
3. Seeds, including Grain
4. Fruit

III. Nest

1. Location
2. How Built?
3. Eggs
4. Incubation

IV. Habitat

1. On Land
2. On Water
3. On Shores, or Banks of Streams

V. Migration

1. First appearance in Spring
2. Latest appearance in Fall

VI. Structure

1. General Shape of Body
2. Head and Bill
3. Wings
4. Legs and Feet
5. Plumage
   - (a) Kinds of feathers
   - (b) Molting
   - (c) Difference between male and female
   - (d) Plumage of the young

VII. Value to man

1. Food
2. Feathers
3. Destroyer of Insects

The above plan is suitable for the study of any bird. It includes more than should be attempted with pupils under 12 years of age. The division or structure should be handled with caution, and those sections requiring dissection should not be attempted with classes under high-school age. In general, follow the plan as far as the interest of the class can be easily maintained.

THE ROBIN

The robin is one of our most common birds. Its cheerful notes and familiar manner make it always welcome. It is so easily observed that it is an excellent bird for children to watch.

SUGGESTIONS

1. In helping young children, at first follow their lead rather than the plan given above. When they are a little older the facts they learn now can easily be systematized and fitted into the plan.

2. Bear in mind that the first object is to get the children interested and enthusiastic.

3. For illustration of the robin and its nest, see color plate *Common Birds,*

facing page 304. This illustration shows both male and female and is correctly colored.

4. In early spring, ask the children to watch for robins and to tell you as soon as they see one. A reward for the child who first reports seeing a robin may intensify their watchfulness.

5. When the robin appears, ask the children such questions as will lead them to look for the points you wish them to observe. The questions may be about as follows:

How is the robin dressed?

What is the color of his coat? His waistcoat? His cap?

Do Mr. Robin and Mrs. Robin dress alike? If not, what is the difference in their dress?

How does the robin walk? Compare his walk with that of a chicken.

How does the robin get a worm out of the ground?

What time does he get up in the morning? Why?

Does the robin eat anything besides worms? If so, what?

CAUTIONS

The success of leading children to observe by such questions as are here given depends upon two things: letting the children find the answers to the questions for themselves, and showing an interest in whatever they tell you.

1. Do not answer the questions for the children. If they have not observed carefully, lead them to continue their observations.

2. Do not ask more than one question at a time. Of course, in looking for the answers to the first two or three questions, they will find the answers to some of the others. But if you ask several questions at once, they will become confused and discouraged. At first one question a day is enough.

OTHER EXERCISES

The children will be much interested in watching the robins build their nest. Your questions will have started them right; now let them tell you what they see from day to day, asking questions only when necessary to direct them to more careful observation.

Eggs and Young. Observing the eggs will require careful supervision on your part, so that the children will not damage the nest or frighten the birds away.

The children will be equally interested in watching the young birds until they are able to care for themselves.

Other Lessons. With a little direction on your part, the children can be led to learn lessons of industry, perseverance, thrift, cheerfulness, courage and patience from the robin and from other birds as well. Have the children learn Edith Thomas's *Robin's Return.*

ROBIN'S RETURN

Robin on the tilting bough,
Redbreast rover, tell me how
You the weary time have passed
Since we saw and heard you last.

"In a green and pleasant land,
By a summer sea-breeze fanned,
Orange trees with fruit are bent,—
There the weary time I've spent."

Robin, rover, there, no doubt,
Your best music you poured out;
Piping to a stranger's ear,
You forgot your lovers here.

"Little lady, on my word,
You do wrong a true-hearted bird!
Not one ditty did I sing,
'Mong the leaves or on the wing,

"In the sun or in the rain;
Stranger's ears would list in vain,
If I ever tried a note,
Something rose up in my throat.

"'Twas because my heart was true
To the North and springtime new;
My mind's eye, a nest could see
In yon old, forked apple tree!"

PLAN FOR THE STUDY OF THE BEE

THE BEE

I. Appearance

1. From the time of the earliest flowers until the last are fading.
2. On what days are they most common?
3. In what part of the day?
4. What flowers do they visit?
5. Mark a bee with a fine brush dipped in paint. Does the same bee return?

II. Habits

1. What does it get from the flowers?
2. What is nectar? Honey? Pollen? Wax?
3. Where is it secured?
4. How does the bee carry it?
5. What good does the bee do to the flower?
6. How does it accomplish this?
7. Why is the bumblebee never found over white clover and the honeybee over red?

III. Characteristics

1. Color

    (a) What color is the bumblebee?
    (b) Are the colors arranged the same on all bumblebees?
    (c) Is there any reason for the bee's conspicuous color?

2. Shape

    (a) What are the distinguishing marks of the bumblebee? The honeybee? The wasp?
    (b) How do the queens, drones and workers differ?
    (c) Find the divisions: head, thorax and abdomen.
    (d) How is the abdomen joined to the thorax?
    (e) How many segments in the abdomen?

IV. Anatomy of Dead Specimen

1. Head

    (a) Study the eyes and ocelli.
    (b) How many segments have the antennæ?
    (c) Long, hairy tongue.
    (d) Labial palpi ending in two short segments.
    (e) Mandibles and maxillæ.

2. Wings

    (a) How many pairs?
    (b) Find the hooks on the front edge of the hind wings. What are they for?

3. Legs

    (a) Find the "pollen basket" on the tibia of the hind leg.
    (b) Describe it.
    (c) Is there pollen in it?

4. Sting

    (a) Describe the sheath.
    (b) Find the two barbed lancets.
    (c) How connected with the poison bag?
    (d) Since the poison is an acid, ammonia or soda water is good for the wound. Why?

V. Home

1. Locate.
2. How built?
3. Describe.

Study the article *Bee*, beginning on page 267, Home and School Reference Work.

PLANS FOR THE STUDY OF ANIMALS

THE DOG

- **Description**
  - Size
  - Structure
  - Appearance
  - Characteristics
- **Uses**
  - Protection
  - Hunting
  - Transportation
- Wolf Dogs
  - Eskimo
  - Shepherd
- Greyhounds
  - Greyhound
  - Irish Wolf
  - Deerhound
  - Lurcher
- Spaniels
  - Spaniels
  - Newfoundland
  - Poodle
  - Setter
  - Retriever
  - St. Bernard
- Hounds
  - Bloodhound
  - Foxhound
  - Beagle
  - Pointer
  - Dalmatian Coach
- Mastiffs
  - Bull Dog
  - Great Dane
  - Mastiff
  - Pug
  - Boarhound
- Terriers
  - Fox
  - English
  - Scotch
  - Skye
  - Irish
- Dog Family
  - Dog
  - Fox
  - Wolf
  - Dingo
  - Coyote
  - Fennec

THE SQUIRREL

- **Description**
  - Body
  - Tail
  - Eyes
  - Teeth
  - Jaws
  - Color
- **Nests**
  - In hollow logs and trees
  - Old buildings
  - Made of wood, leaves, etc.
- **Food**
  - Nuts
  - Corn
  - Acorns
  - Where stored
  - Manner of eating
- **Uses**
  - Fur
  - Food
- **Damages**
  - Destroy crops
  - Destroy birds' nests
- **Species**
  - Red
  - Gray
  - Fox
  - Flying
  - Black
  - Chipmunk
  - Oriental
- **Squirrel Family**
  - Marmot
  - Gopher
  - Prairie Dog
  - Woodchuck

PLAN FOR THE STUDY OF THE OSTRICH

- **Description**
  - Size
  - Height
  - Weight
  - Head
  - Eyes
  - Beak
  - Feathers
    - Of male
    - Of female
  - Wings
  - Color
    - Of made
    - Of female
    - Of chick
- **Characteristics**
  - Food
  - Speed
  - Nest
  - Eggs
  - Wild state
  - Domesticated
- **Ostrich Farms**
  - California
  - Arizona
  - Florida
  - South Africa
- **Ostrich Family**
  - Ostrich
  - Emu
  - Cassowary

PLAN FOR THE STUDY OF THE DUCK

- **Mallard**
  - Appearance
  - Plumage
  - Size
  - Original of domesticated duck
- **Canvasback**
  - Appearance
  - Value
  - Where found
- **Gadwall**
  - Appearance
  - Size
  - Value
  - Where found
- **Wood Duck**
  - Beauty
  - Habits
  - Migration
- **Eider Duck**
  - Appearance
  - Size
  - Habits
  - Value
- **Favorite Species**
  - Normandy
  - Aylesbury
  - Picardy
  - Musk
- **Size**
  - Comparative
  - Largest variety
  - Smallest variety
- **Appearance**
  - Body
  - Plumage
  - Tail feathers
  - Feet
- **Food**
  - Animal
  - Vegetable
- **Uses**
  - Food
  - Feathers
  - Down

PLAN FOR THE STUDY OF IRON

I. Ores
- 1. Kinds
  - (a) Red hematite
  - (b) Brown hematite
  - (c) Magnetite
  - (d) Spathic iron
- 2. Distribution
  - (a) United States
    - Minnesota
    - Michigan
    - Pennsylvania
    - Virginia
    - New York
    - Other states
  - (b) Foreign Countries
    - Canada
    - England
    - Russia
    - Germany
    - Austria
    - Scandinavian countries

II. Mining Ores
- 1. Blasting
- 2. Steam Shovel

III. Shipping
- 1. By Boat
  - (a) Methods of loading
  - (b) Methods of unloading
- 2. By Train

IV. Smelting
- 1. Crusher
- 2. Blast Furnace
- 3. Manner of Smelting

V. Properties of Iron
- 1. Ductility
- 2. Malleability
- 3. Hardening
- 4. Magnetism
- 5. Strength

VI. Impurities
- 1. Carbon
- 2. Silicon
- 3. Sulphur
- 4. Phosphorus

VII. Varieties
- 1. Pig Iron
  - (a) Characteristics
    - Rough
    - Brittle
    - Coarse
  - (b) Uses
    - Common castings
    - Stoves, etc.
    - Manufacture of wrought iron
- 2. Wrought Iron
  - (a) Characteristics
    - Soft
    - Flexible
    - Ductile
    - Malleable
  - (b) Uses
    - Wire and nails
    - Rods and bars
- 3. Steel
  - (a) Characteristics
    - Tough
    - Tenacious
    - Hard or soft
    - Elastic
  - (b) Uses
    - Framework of buildings
    - Bridges
    - Rails and ties
    - Machinery
    - Springs for carriages, cars, clocks, watches
  - (c) Manufacture
    - Blister steel
    - Bessemer steel
    - Open-hearth steel

VIII. Compounds of Iron
- 1. Oxides
- 2. Sulphides
- 3. Chloride
- 4. Hydrates

IX. History
- 1. Ancient
  - Egyptians
  - Babylonians
  - Assyrians
  - Greeks
  - Iron Age
- 2. Modern
  - United States
  - England
  - Germany
  - Other countries

X. Uses of Iron in Medicine
- 1. Blood Purifier
- 2. Aid to Digestion

STUDY OF PLANTS

PLAN FOR THE STUDY OF A PLANT

I. Place of Growth

1. In a group or singly
2. Altitude
3. Soil
4. Wild or Cultivated

II. Manner of Growth

1. Herb
   - (a) Land
   - (b) Water
2. Shrub
   - (a) Climbing
   - (b) Twining
   - (c) Erect
3. Tree

III. Description

1. Roots
   - (a) Taproot
   - (b) Fibrous
   - (c) Fleshy
   - (d) Aerial
2. Stem
   - (a) Bulb
   - (b) Bark or Outer Covering
   - (c) Character
   - (d) Juice or Sap
3. Leaves
4. Flowers
5. Fruit

IV. Uses

1. Ornament
2. Food

V. Scientific Facts

1. Name
2. Family
3. Relatives

PLAN FOR THE STUDY OF FRUITS

I. Composition

1. Single—Peach
2. Aggregate—Raspberry
3. Accessory—Wintergreen
4. Multiple—Pineapple

II. Texture

1. Fleshy
   - (a) Berry—Currant
   - (b) Pepo—Melon
   - (c) Pome—Apple
2. Stone—Plum
3. Dry
   - (a) Grain—Wheat
   - (b) Nut—Walnut
   - (c) Pod—Bean
   - (d) Cone—Pine
   - (e) Akene—Maple
   - (f) Capsule—Poppy

III. Dissemination of Seeds

1. Dehiscent—Open at Maturity—Pea
2. Indehiscent — Not Opening at Maturity—Pear

SUGGESTIONS

1. The plan here given is suitable for the study of any plant at any season of the year. The complete study of any plant must extend through the period required for it to germinate, grow, blossom and bear fruit.

2. Annuals that blossom early in the spring are simple in structure, and form the best specimens with which to begin the study.

3. The principal objects of the study of plants with young children are to lead them to learn:

(a) Where the plant grows.
(b) The kind of soil it likes best.
(c) The time when it first appears.
(d) The time it blossoms.
(e) The color, size and shape of the blossoms and whether they occur singly or in clusters.

(f) The parts of the plant as a whole—root, stem, leaves and blossoms.
(g) The sort of fruit the plant bears and the time of ripening. (This should be deferred until the fruit is ripe.)

With more advanced pupils the analysis should be extended to include parts of the flower, parts of the leaves, etc. Those who wish to make a systematic record of their observations will find the *Botanical Chart* here given very helpful. The pages of a note book can easily be ruled for the purpose.

The following chart is planned for use in the field. Several of the most common families are named, and their prevailing characteristics are noted. When a new plant is found, its family can be recognized by comparing its parts with the description in the chart. After the chart has been used for a time, it will be possible for the student to recognize the family to which a plant belongs even when the plant itself is not known. The chart should be extended by the student to include all the families represented in his locality.

BOTANICAL CHART

Family	Character	Leaves	Flower	Fruit	Representative Plants
Crowfoot	Herbs Rough stems Watery juice	Much-divided	Parts separate Many stamens	Berry, pod or akene	Buttercup Anemone Pasque Flower
Lily	Herbs Bulb	Parallel-veined	Parts in sixes	Seldom forms	Adder's Tongue Clintonia Day Lily Lilly-of-the-Valley
Mustard	Rough herbs Pungent juice	Coarse and hairy; often lobed	Parts in fours in form of cross	Pod or Capsule	Radish Cabbage Shepherd's Purse
Mint	Herbs with square stems	Aromatic	Small-tubular and two-lipped	Nutlets	Catnip Ground Ivy Mint Rosemary Lavender
Pulse	Herbs, Vines or Trees	Compound	Butterfly-shaped	Pod	Bean Clover Pea Locust
Rose	Shrubs and Trees	With wings at base of stem	Regular Fragrant Many stamens	Luscious Generally edible	Apple Plum Peach Rose Bramble
Composite	Herbs or Shrubs	Various	Close-clustered in heads and surrounded by bracts and rays	Various	Aster Dandelion Chrysanthemum Daisy Lettuce

THE VIOLET

SUGGESTIONS

1. Adapt the plan here given to the study of the violet, since it is one of the earliest and simplest of the spring flowers.

2. A good way to begin is to secure the children's assistance in planting some pansy seeds.

3. Lead the children to care for the growing seeds and the young plants.

4. When the plants are ready for transplanting, each child should be allowed to transplant a few plants. These he should consider his own, and should care for them through the season.

The children will soon discover that those who take the best care of their plants will gather the largest and handsomest pansies.

5. Ask the children to find wild violets and to tell you where they grow.

6. See how many different kinds of violets they can find in the locality.

TRANSPLANTING PANSIES

CAUTION

Children should be taught not to pick or otherwise ruthlessly destroy wild flowers. Lead them to see how soon the flowers wilt when plucked and how much more beautiful they are in the place where they grow, in the midst of their beautiful surroundings.

WORKING IN THE GARDEN

THE YELLOW VIOLET

When beechen buds begin to swell,
  And woods the blue-bird's warble know,
The yellow violet's modest bell
  Peeps from the last year's leaves below.

Ere russet fields their green resume,
  Sweet flower, I love, in forest bare,
To meet thee when thy faint perfume
  Alone is in the virgin air.

Of all her train, the hands of Spring
  First plant thee in the watery mould,
And I have seen thee blossoming
  Beside the snow-bank's edges cold.

Thy parent sun, who bade thee view,
  Pale skies, and chilling moisture sip,
Has bathed thee in his own bright hue,
  And streaked with jet thy glowing lip.

Yet slight thy form, and low thy seat,
  And earthward bent thy gentle eye,
Unapt the passing view to meet,
  When loftier flowers are flaunting nigh.

Oft, in the sunless April day,
  Thy early smile has stayed my walk;
But midst the gorgeous blooms of May
  I passed thee on thy humble stalk.

So they, who climb to wealth, forget
The friends in darker fortunes tried.
I copied them—but I regret
That I should ape the ways of pride.

And when again the genial hour
Awakes the painted tribes of light
I'll not o'erlook the modest flower,
That made the woods of April bright.

—*William Cullen Bryant.*

THE GARDEN

Whenever possible children should become interested in gardening. Were this interest more widely extended, many unsightly back yards and vacant lots in towns and cities would be transformed into places of beauty and at the same time be made to add valuable contributions to the food supply of the family.

School gardens are deservedly popular, but they do not preclude a garden at home, and unless the school garden leads to a permanent interest in the home garden, it fails in one of its most important missions. Both parents and teachers should encourage children to make gardens at home.

SUGGESTIONS

1. Give each child a small plot of ground. Impress upon him that he is to be responsible for the planting and care of the plot, and that whatever he raises upon it will be his.
2. Lead each child as far as possible to plant common things, vegetables used by the family, common flowers, and, if there is space, a few hills of corn and potatoes.
3. See that the children have fair play; give them plots of good ground and suitable tools so that they will have every encouragement at the beginning.
4. Establish such confidence that the young gardener will feel free to come to you for advice and suggestions. This will contribute much towards the success of the experiment.

THE STUDY OF TREES

Of our swift passage through this scenery
Of life and death, more durable than we,
What landmark so congenial as a tree
Repeating its green legend every spring,
And, with a yearly ring,
Recording the fair seasons as they flee,
Type of our brief but still-renewed mortality?

—*Lowell.*

VALUE OF FORESTS

Old and young alike should be interested in trees. Gifford Pinchot, formerly chief forester of the United States, pays the following tribute to our forests:

"Next to the earth itself, the forest is the most useful servant of man. Not only does it sustain and beautify the land, but it also supplies wood, the most widely used of all materials. Its uses are numberless, and the demands which are made upon it by mankind are numberless also."

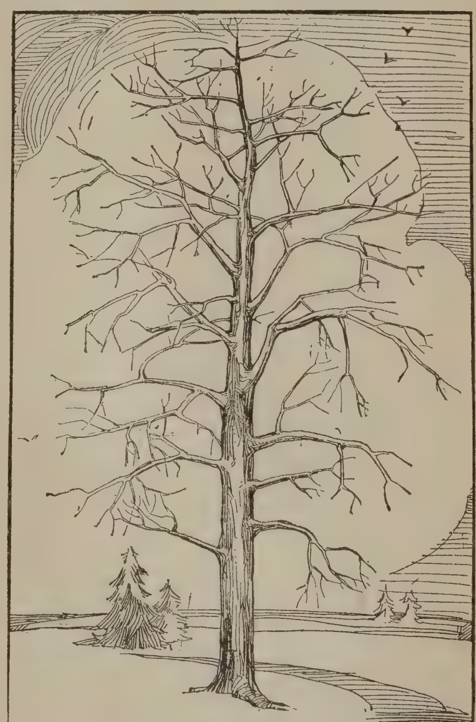


FIGURE 1

Abundance leads to wastefulness, and the vast extent of forests in North America have caused the people of the United States to be so prodigal in their destruction that before the end of our second

century as a nation, some sections are confronting a lumber famine and others have suffered irreparable loss by the total destruction of their forests.

These and other alarming conditions have caused the National Government to put forth its best efforts to protect the forests still standing and to reforest regions from which the timber has been removed. Many states are also supplementing the work of the government, and in this movement everyone should take an interest. See FORESTRY.

PLAN FOR THE STUDY OF A TREE

TREE

- I. **General Description**
  1. Roots
  2. Trunk
  3. Branches
  4. Leaves
  5. Fruit
  6. Bark
- II. **Location**
  1. Parts of the world
  2. Highlands
  3. Lowlands
- III. **Varieties**
- IV. **Uses**
  1. Trunk
  2. Branches
  3. Bark
  4. Leaves
  5. Fruit
  6. Sap

GENERAL SUGGESTIONS

1. Protect young trees. This is work in which children as well as adults should become interested. Every year thousands of young trees are destroyed through ignorance or thoughtlessness. The boy wants a stick and cuts the bush or twig that suits his fancy. By this act he probably destroys what in time would become a tree. Fires are often allowed to burn over land on which young trees are growing because the trees are considered of little value. Many of the forest fires which cause the destruction of such extensive forests are caused by carelessness.

2. Prevent injuries. Explain to the children how trees are injured by cutting into them, by injuring the bark, by hitching horses to them and by numerous other common practices which should be avoided.

3. Stimulate observation by such questions as:

How many different kinds of trees grow in our locality?

How many trees can you recognize by their bark?

How many by their wood?

How many by their leaves?

4. Lead children to discover the different uses of the various trees in their locality.

5. Adapt the lessons to the season. Trees can be studied all months in the year, but the study should be of those facts and features most easily observed at the time. If the lesson begins in the spring, the putting forth of leaves and flowers will be of special interest; if in winter, the arrangement of the branches; if in autumn, the falling of the leaves and preparation of the tree for winter should receive special attention.

BRANCHING

The shape of the crown or top of a tree is determined by the arrangement of its branches. There are two general plans

of branching. In the first the trunk extends through the tree to the top of the crown. The beech and pine are good ex-

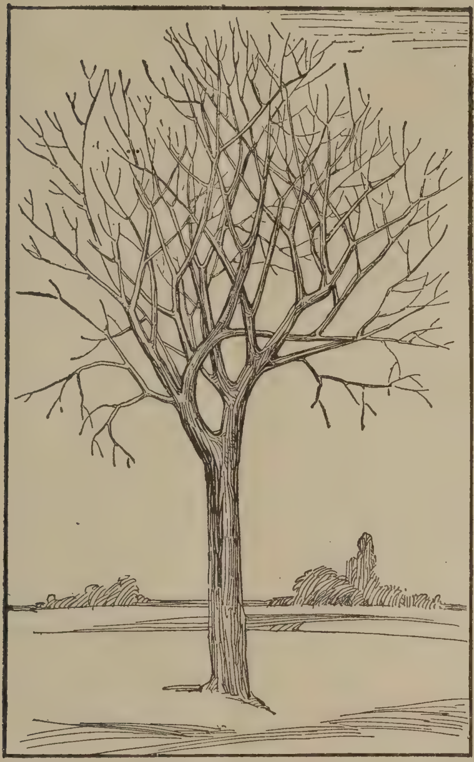


FIGURE 2

amples. See Figure 1. Compare the crowns of these trees and notice their difference in form. Again, this is accounted for by the arrangement of the branches. Let the pupils discover in what the difference consists.

They should see that the conical shape of the pine is due to arrangement of the branches in whorls, while the shape of the beech is due to an entirely different arrangement.

In the other arrangement the trunk divides into several large branches which extend in different directions. This plan forms a crown that is usually at the top. The elm, the maple and the apple tree are examples. See Figure 2.

The winter is the most favorable sea-

NEEDLES AND GROWING CONE, WHITE PINE

MATURE CONES AND SEED, WHITE PINE

son for studying the branching of trees, since there are no leaves to obstruct the view.

This line of work should not be undertaken with children under ten years of age.

PLAN FOR THE STUDY OF THE PINE

THE PINE TREE

- **I. General Description**
  1. Roots
  2. Trunk
     - Bole
     - Crown
  3. Branches
  4. Leaves
  5. Fruit
  6. Duration
- **II. Where Found**
  1. At sea level and on mountains up to an elevation of more than 7000 feet.
  2. Among a tropical foliage, as in Cuba; *generally* in the *temperate zones* and somewhat in the frigid.
  3. On both American continents and in Europe, Asia and Africa.
  4. Usually in forests to the exclusion of other trees.
  5. In soils only moderately wet, usually sandy and poor rather than rich.
- **III. Growth**
  1. From seeds, which ripen slowly, in from one to four years, according to the species.
  2. To a height of from 75 to 300 feet, and a diameter of from 2 to 10 feet, according to the species.
- **IV. Varieties**
  1. White Pine
  2. Yellow, Georgia or Southern Pine
  3. Red, or Norway, Pine
  4. Spruce Pine
  5. Sugar Pine
  6. Bull Pine
  7. Silver Pine, and perhaps 70 Other Varieties
- **V. Uses**
  1. Roots — Tar
  2. Trunk — Lumber, paper, turpentine, balsam, charcoal, lampblack. Inner bark for making ropes and for flour, sometimes eaten by poor people of European countries.
  3. Branches — Hungarian balsam.
  4. Needles — Fiber for blankets and clothing. Medicinal oils.
  5. Seeds — Food by certain tribe of Indians and some people of Europe.

GENERAL SUGGESTIONS

1. Read the article *Pine,* HOME AND SCHOOL REFERENCE WORK, page 2260.
2. Apply the general suggestions for the study of trees to the pine.
3. Determine the variety which grows in your locality and let most of the study be given to that variety.
4. Incidentally call attention to other varieties and the localities in which they are found.
5. Have pupils ascertain from observation the numerous uses to which the tree is put. The older pupils can add to the list of uses by reading.
6. After the study is completed, let the pupils write a story on the pine and illustrate it by their own drawings.

PLANTING TREES

Many lawns, public parks and streets could be made more beautiful by increasing the number of trees in them. In cities the trees in streets and parks are usually planted and cared for by specialists employed by the city authorities, but in the country this work must be done by those who live there; therefore the boys and girls should be taught how to plant trees.

The following directions taken from *Farmers' Bulletin, No. 134,* United States Department of Agriculture, are given as the result of long experience on the part of those who prepared the bulletin, and will be found very helpful.

Preparation of the Soil. Thorough preparation of the soil should precede the planting. Where blocks or belts are to be formed, the ground should be plowed and prepared as for a garden crop. Clay soils are best plowed the previous fall, in order that the ground may weather over winter. On such soil subsoiling is beneficial, and should precede the planting by at least one season. Just before planting time the ground should be pulverized with a roller or harrow. If the planting is to be done in rows, the ground should be marked off lengthwise and crosswise and the trees set at the intersections. It is sometimes desirable to mark off the ground only one way and run furrows the other. In arid regions the furrows may be deepened into trenches, so that rain water which falls on the surrounding ground may be drained to the tree. On the other hand, in regions having a copious rainfall it will frequently be necessary to plant the trees on a raised portion or mound of earth in order to keep the soil dry enough for them to thrive. The holes should be dug large enough to contain all the roots fully spread out, and deep enough to allow the tree to stand about three inches lower than it grew as a seedling.

Time and Manner of Planting. South of the 37th parallel, fall planting is safe and often advantageous. North of this, spring planting should be the rule, as fall-planted trees can scarcely develop sufficient roots to sustain themselves during the winter. The most successful nurserymen practice early planting for deciduous trees, beginning operations as soon as the ground ceases freezing. Evergreens are not planted until later; some even wait until the young growth is starting. If possible, planting should be done on a cool, cloudy day. Unless the day is very moist, the trees should be carried to the planting site in a barrel half filled with water, or a thin mixture of earth and water, and lifted out only as they are wanted. Even a minute's exposure to dry air will injure the delicate roots—the feeders of the tree.

The roots should be extended in their natural positions and carefully packed in fine loam soil. It is a good practice to work the soil about each root separately and pack it solid with the foot. As the hole is filled, the earth should be compacted above the roots and around the stem, in order to hold the tree firmly in place. The last two inches of soil should be very fine, and should lie perfectly loose. It will serve as a mulch to retain the moisture.

Trees should be planted neither in very wet nor in very dry soil. If the soil is

wet, it is better to wait until it is dryer. On the other hand, if good cultivation has been maintained the year previous to planting, the soil is not likely to be so dry that trees will not start. Besides insuring a supply of moisture, such cultivation puts the ground in good physical condition for planting.

With this treatment, watering will scarcely ever be necessary. If it is, the holes may be dug a few days beforehand and filled with water. They should be refilled as the water soaks away until the soil is fully moist. A thorough irrigation, when that is possible, is still better. As soon as the soil becomes somewhat dryer the trees should be planted. While it is a common custom to water at the time of planting, those who do no watering are usually the most successful. Even in the semiarid regions some successful growers apply no water, but keep up an excellent system of cultivation, thereby retaining the soil moisture.

The spacing of the trees is not so important in school-ground planting as in forest plantations, yet it is worth consideration. The trees should not stand so near together as to produce long, slender poles; on the contrary, short, thick trunks are desirable, to support large tops and withstand heavy winds. From 8 to 12 feet apart will be suitable spacing distance. Where large blocks are to be planted the trees may be closer, but it is scarcely ever desirable to plant them closer than 6 by 6 feet.

WHY TREES DIE IN TRANSPLANTING

To many persons it is a mystery why trees die after being transplanted. They do not die without cause, however, and when one begins to wither something is wrong. Oftentimes the result is not to be noticed until weeks after the injury; in other cases it is apparent in a few days. After the injury has been done it can be overcome only by the subsequent growth of the tree. All the assistance that can be given is to make the surroundings of the tree favorable for growth. The following are some of the causes of death among transplanted trees.

Loss of Roots. The loss of the principal part of its root system when the tree is being taken up is a great shock to its vitality, and frequently causes its death. A very large part of the root must be cut off, for usually the space surrounding the tree is filled with fibrous rootlets, myriads of which can scarcely be detected with the naked eye. Almost all of these are lost, as well as many of the larger roots. Mr. D. C. Burson, of Topeka, Kan., last year dug up and measured as much as he could of the root system of a vigorous Hardy Catalpa seedling that had grown from May till November. This six-months-old seedling showed over 250 feet of root growth. By the methods in common use only a fifth, or perhaps as little as a tenth, of the root is taken up with the tree in transplanting. Such loss throws the root out of balance with the top. If the top is not shortened, or in some way protected, the leaves may evaporate more moisture than the roots can provide, resulting in the death of the tree.

Exposure before Planting. With proper subsequent treatment a tree can endure the loss of many roots, but instead of the needed protection it often gets much unnecessary exposure to sun and dry air. This may be in digging, packing, shipping, unpacking, or any other of the various handlings which it undergoes between its removal from the ground and subsequent planting. On a warm day in March the writer saw a bundle of trees in shipment across the plains of Texas without the slightest covering. Before the destination was reached the roots became withered and almost dry, having suffered a hundred times more exposure than the ordinary tree can stand without injury. Not many persons would be guilty of such gross neglect, but the fact remains that exposure causes the death of more trees in transplanting than any other single cause. Exposure can usually be easily

prevented, and no one who persists in neglectful practices can hope to be successful.

Failure to Plant Well. The failure to pack the soil tightly about the roots is a common error in planting. It causes injury in two ways: It leaves the tree unstable, to be rocked to and fro or even blown down by the wind; it also prevents the first growth of rootlets from absorbing food. This they cannot do unless good, fine soil is firmly packed about them. Clods will not pack snugly. Likewise, manure or litter of any kind mixed with the soil may prevent firm packing. Anything that prevents the soil particles from coming into close contact with the roots is sure to be injurious. Another error is in shallow planting. This allows wind and water to lay bare the roots, and in a short time the tree dies. Crowding the roots into too small a hole is a similar difficulty. Such errors are more often due to lack of experience and skill than to haste. The unskillful planter will hardly plant well, however slowly he may go.

Wet Soil. Trees are often injured by being planted in wet soil. Whether the excessive moisture is a permanent or a temporary condition is likely to make little difference in the results. If it is permanent the water prevents the air from reaching the roots, while if it is only temporary the trampling of the soil over them causes it to stick together so that on drying it becomes baked, leaving them impacted in a hard lump of earth which excludes the air. Excessive air currents in the soil are injurious by drying the roots, but a constant permeation of the soil by the air is necessary to supply oxygen. This process is precluded by either the saturation or the baking of the soil. Undrained pockets occur here and there even in well-drained fields, and are always difficult to deal with in tree growing.

Drying Out of the Soil. Another cause of death is the drying out of the soil. Summer droughts are not unknown in any part of the country, and are very frequent in parts of the Mississippi Valley and on the Plains. Occasionally they are so intense and long continued that it is difficult to make recent transplanted trees survive, even when carefully planted and cultivated. In such a time, those which are poorly planted and cultivated are almost sure to die. Frequently, too, weeds and grass grow up in the plantation and draw off the moisture, thereby greatly diminishing the supply for the young trees.

On a school ground there is likelihood of the trees being injured by the trampling of the soil. The pupils will naturally wish to play among them, and unless they are restrained the soil will soon become compacted. It then dries out very quickly, and in time of drought the trees are sure to suffer, and may be killed.

TREES

I think that I shall never see
A poem lovely as a tree.

A tree whose hungry mouth is prest
Against the earth's sweet flowing breast;

A tree that looks at God all day,
And lifts her leafy arms to pray;

A tree that may in Summer wear
A nest of robins in her hair;

Upon whose bosom snow has lain;
Who intimately lives with rain.

Poems are made by fools like me,
But only God can make a tree.

—*Joyce Kilmer.*

THE MILKWEED

The following sketch of the study of the milkweed by Mr. Jesse L. Smith, Superintendent of Schools, Highland Park, Ill., is inserted here because it is such an excellent illustration of what an enthusiastic teacher can do along the line of nature study.

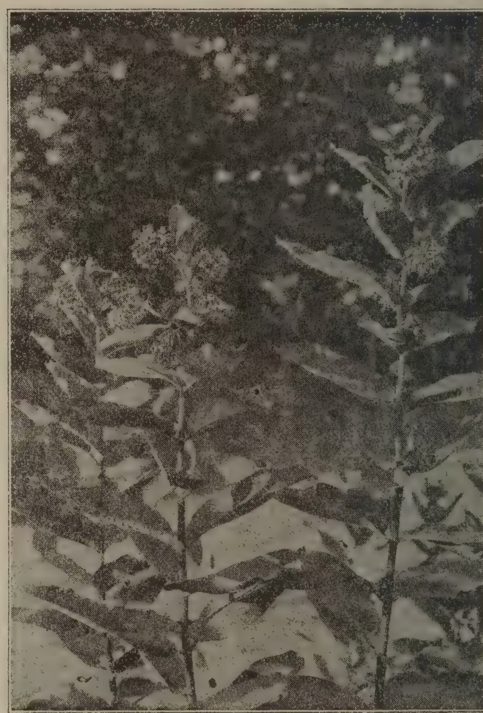
A most pleasing fragrance infests the air! The common milkweed has hung out its balls of blossoms, and through the numerous lanes of the air and over devious trails in the grass and the jungles of weeds, a great host of insects, some a-foot and some a-sail, responds to the odorous invitation. Honeybees and bumblebees, moths and butterflies, and various other winged creatures come to a feast of nectar, and spiders and spotted beetles come to prey upon the unwary. Long files of ants stream up the stem of the plant to filch the sweets from the sluggish herds of plant lice which feed on the broad surfaces of the leaves. The monarch butterfly, a skilled botanical specialist, arrives and with unerring instinct deposits its egg on almost the only plant upon which its caterpillar can thrive. Consider the milkweed! The lily of the field is not so wonderful as is this blossom host so eagerly sought out by insect guests.

The Plant

A stout plant is the milkweed, and symmetry and vigor are its characteristics. From a thick rootstock deeply embedded, it sends up its straight shaft of stem with its broad leaves in pairs, in well-ordered arrangement, each pair hung out in space at right angles to its neighbors above and below. A rubber plant it would seem, with a thick milky fluid for sap which wells out freely as the plant's visible protest at dismemberment.

The Blossom

The blossoms of the milkweed occur in nodding umbels, each consisting of a hundred or more blossoms drooping on slender pedicels. Snip off some of these blossoms, stem and all, and drop them upon a sheet of paper as in Figure 2. Here is no simple combination of sepals and petals, of stamens and pistils. To be sure, one may recognize at a glance the petals folded back along the flower stem and the sepals similarly disposed hidden by the petals. But more conspicuous than these appears a crown of five hooded bodies, or nectar jars, above the bases



THE MILKWEED

of the petals. Cut away close the stems and set up each blossom so that we may look down into their centers, as in Figure 3. The nectar jars flare open and a curved horn protruding outward points down toward the disk which the nectar

jars surround. The stamens, it seems, have cohered to form this central disk, their filaments making a tube enclosing the pistil, and their anthers adhering to the stigma.

As if this arrangement of stamens and pistils were not puzzling enough, there is a story more complex still of the stowing away of the pollen masses in the anther cells and of the hidden recesses wherein are the stigmatic surfaces which await the transfer of pollen masses from another flower. The accompanying illustrations do not help much in our story, but as one looks at the central disk in one of the flowers shown in Figure 3, one may imagine two vertical cells in each of the five anthers, which, embodied edge to edge, make the wall of the disk. In each of these ten cells is embedded a waxy pollen mass, and each of these pollen masses is prolonged upwards to meet a pollen mass similarly prolonged from out the nearer cell of an adjoining anther. The two prolongations fuse into one black tip which stands up in plain sight at the upper part of the disk. Let's test our new-found knowledge! Pry under one of the black tips with a needle. Something gives way and comes up. A sort of clothes pin or pinch clip appears (Figure 4), its two straddling legs terminating in inflated pollen masses, each of which has been stowed away deep in an anther cell.

Figure 2

Fertilization

Now most of us think of pollen as the flower dust that is poured out of the anthers much like grains of wheat from a bag, and we picture the pollen as tossed about by the wind or borne from blossom to blossom on the powdered bodies and legs of insects. This is indeed true of most pollen, but it is not true of that

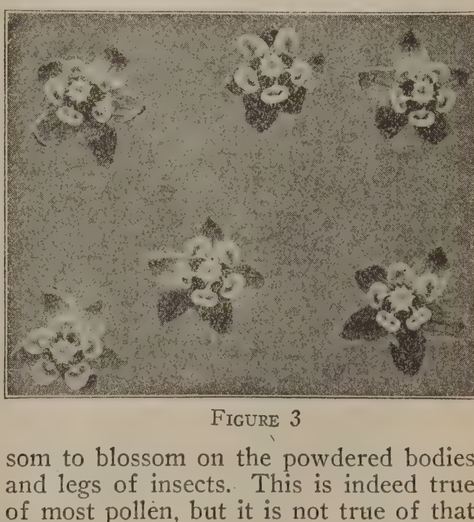


Figure 3

of the milkweed. We have found its pollen in masses attached to a forked clip and we have had to pry up on this clip to extricate the pollen masses from the cells in which they were embedded. This the wind cannot do nor will the casual brushing of an insect's body start the pollen on its journey. Who shall do this for the flower and what shall be the inducement?

Just a moment! When we talk of pollen we must also talk of stigmas and stigmatic surfaces, for one is the complement of the other. "Useless each without the other."

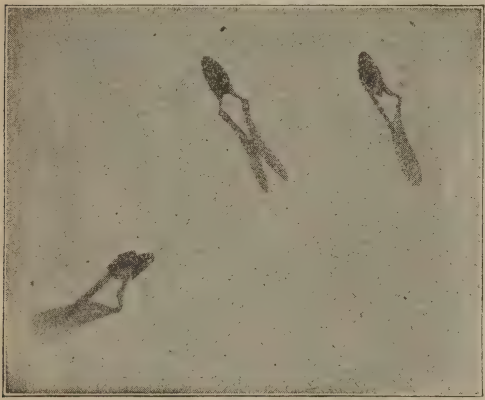


Figure 4

One must go back to the disk of the flower to find a lodging-place for pollen brought, as nature prefers, from another flower. Five narrow slits appear at equal intervals on the sides of the disk. Above each slit appears the black tip of one of the pollen pinch clips. Each pinch clip straddles the upper end of a slit. Each slit admits to the inner stigmatic surface of the flower and there the pollen must find lodgment if fertilization of the flower is to be effected.

The stage is set for the actor, and now the nectar jars come into the story—five nectar jars, five pairs of pollen masses on forked clips, and five vertical slits on the smooth sides of the disk. The actor is preferably a bumblebee, stout of limb and resolute of purpose. There is real work ahead of him. He has only nectar in mind but he is a dispenser of pollen and knows it not. He alights upon the smooth surface of the flower. He thrusts his feet into the open slits to brace himself for the feast, and when he draws up his leg he is very like to jerk out a pinch clip of pollen. With this astride his leg or tangled in his claws he alights on another blossom. As he thrusts his pollen-laden foot this time into an inviting slit he stuffs a pollen mass therein, and the hidden surface of the stigma is thus smeared with pollen. "Cross-fertilization" is accomplished, and here endeth the story so far as the bumblebee is concerned. The honeybee and various flies are lured into the same rôle, but they do not often fare so well as the bumblebee. They, too, wedge their feet deeply in the stigmatic slit and frequently to their own undoing. It requires a strong pull on the part of the insect to free itself from the entanglement and draw out the pollen clip. Many are trapped in the struggle and become a prey to marauding ants or die of exhaustion.

Figure 5

The writer once came upon a fly that had just become entangled in a ball of milkweed blossoms and that was voicing his discontent in his loudest tones. One pair of legs was entangled in the stigma slits of one blossom, and another pair was wedged into a stigma slit of an adjoining blossom. Figure 5 shows the fly after his attention had been diverted from his troubles by chloroform, and one of his pairs of legs had been pulled loose from the one blossom. A pair of pollen clips is seen attached to each of these legs. The hindmost pair of legs is still caught in the slits of the other blossom.

The Giant Butterfly

With the description of the milkweed might be included the history of the monarch butterfly, but that is a story by itself. It is a story of a minute porcelainlike egg deposited on the fuzzy underside of the leaf. The egg in due time becomes a tiny caterpillar with a beady black head, and the caterpillar eats so much and grows so rapidly that in fifteen days or so he is ready to forswear the ways and fashions of a caterpillar. A few hours suffice it to change itself into a beautiful pea-green chrysalis decorated with black bands and bronze spots. The days go by and at length it leaves its low-vaulted past and comes out a brown butterfly with black-veined wings. It is the monarch among butterflies, a master aviator who recks not of air pockets and rides the swift gale at his ease.

The Fruit

The story of the fruiting of the milkweed can only be outlined here. A single stout plant may bear eight or more umbels with a total of more than one thousand blossoms. A blossom may produce one milkweed pod and sometimes two. If each of these blossoms should be permitted to develop its fruit what a prodigious crop of pods there would be! As a matter of fact not more than ten out of the thousand blossoms will be represented in the ripened fruit, and these may not produce together more than a dozen pods. But these dozen pods may contain a total of three thousand seeds or more! If all of these seeds should grow, the world would speedily have a plague of milkweeds. As history does not record such a plague, it is safe to conclude that very few milkweed seeds are given the privilege of having descendants.

Species

Eighteen species of milkweeds abound in the United States east of the Rocky Mountains. The most commonly known, *Asclepias syriaca,* has been the subject of the preceding sketch. The most brilliantly colored milkweed blossoms belong to the butterfly weed, *Asclepias tuberosa,* a plant that has no milk in its veins. Its orange-colored blossoms light up sandy wastes and dry hillsides. The most delicacy of beauty belongs to the blossoms of the poke milkweed, *Asclepias phytolaccoides,* which is a tall plant of copses and moist woods. Its blossoms are ivory white on drooping stems. The most beautiful of all the milkweeds is the showy milkweed, *Asclepias speciosa,* which has purple blossoms, larger and more striking in outline than those of the common milkweed. This plant is at home only west of the Mississippi. And so, no more about the milkweed.

THE MILKWEED CASE

Cover and case locked close together,
Filled with a curious kind of feather,
Open the box, you'll need no key,
Oh! pretty green case did you grow for me?
'Twas only the other day I said,
I must make my dolly a feather bed,
And here is the softest fluffiest stuff,
Silky and white and plenty enough.

—*Selected.*

BIRDS AS NEIGHBORS

SUGGESTIONS FOR BOYS AND GIRLS

One autumn morning as a New York family was seated at the breakfast table, a young woodthrush flew into the room through the open window. It was on its journey South, and had evidently wandered away from the rest of the flock. Weary and hungry, it alighted on the frame of a picture, then spied some branches of alder berries in a vase on the mantel below. Forgetful of its interested watchers, it made a hearty meal of the tempting fruit, refreshed itself with water from a cup near by, and then cheerily departed on its journey.

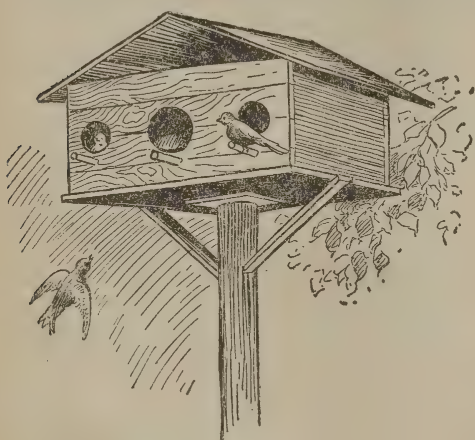


FIGURE 1

The desire to satisfy hunger and thirst must have been very strong in this case, for we know that naturally the birds are very shy. However, they will respond to invitations, and those who love to hear the songs of birds and who find it interesting to watch them through the summer days as they engage in their pretty domestic occupations, can do much to entice them to become neighbors. In sections where there are no brooks or lakes the birds find the problem of obtaining water a serious one. A shallow pan filled each day once or twice with fresh water and placed on a stump or other support will attract numerous visitors, and the children will have the time of their lives watching the antics of the pretty creatures about the basin.

One observer relates that sixty-nine different species of birds came in one season to drink on a suburban lawn, including a cheeky little wren that acted as if the pan were his especial property. One must be careful to put the pan where the birds will not be in danger from their enemies. Under no circumstances let it rest on the ground if there are cats about the premises.

There are several kinds of bird houses that any child of ordinary ingenuity can make. A few of these are shown in the accompanying illustrations.

Bird houses can be located on barns or other outbuildings, in trees and on poles erected for the purpose. The pole is the most satisfactory in the end, but

FIGURE 2

it requires the labor to erect it and increases the expense unless one has poles on hand. The pole should be at least six inches in diameter and fifteen or sixteen feet high. It should be located so that the bird house will be under shade a part of the day. In setting, care should be taken to place the pole in a vertical position and to station it firmly in the ground.

The bird houses shown in the illustrations are easily made. Figure 1 consists of a small box with holes cut in the sides and a roof over the open top. Square holes answer the purpose as well, but they are not artistic.

In Figure 2 a box of different shape is used, and the ends are sawed so as to form gables. The roof is similar to that in Figure 1. Figure 3 shows how a hollow log can be made into an attractive bird home. The ends are closed with boards fitted to the log. The fender on the pole is for the purpose of protecting the birds from cats.

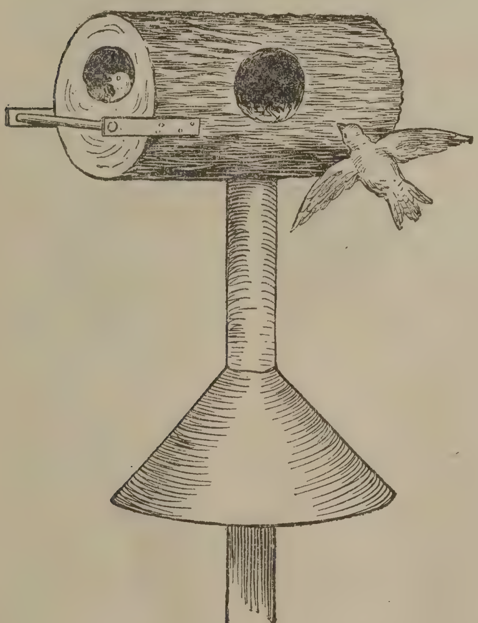


FIGURE 3

Figure 4 is the most artistic and also the most difficult to make. The appearance of a log house can be secured by covering a box with sticks about an inch in diameter, split through the middle. This is much easier than constructing the house of round sticks by notching the ends and fitting them together.

FIGURE 4

A friend of ours says that in her home town two bird houses were put up in a certain yard. One was made out of a cigar box; the other cost about ten dollars and was elaborately painted. The birds religiously avoided the handsome mansion prepared for them and took up their abode in the hut. For one thing, they do not like paint. Several single-room cabins are preferable to a large tenement accommodating a number of bird families, for they love privacy in the nesting season. Have the homes ready in the spring; some of the birds are looking for nesting places as early as March.

From o'er the hill, a whip-poor-will,
Blends in a note with mountain rill;
And out at dawn in cheerful glee,
The bluebird greets the honey-bee;
While hills and knolls and space between,
Turns to a mottled mass of green;
And everything with gentle ring,
In rapture shouts, "'Tis spring, 'tis spring!"

—*Robert Sparks Walker.*

THE DEADLY FLY

A PRACTICAL APPLICATION OF NATURE STUDY

Summer is the time to protect the home from insects. Of these the most deadly and the most to be feared is the common house fly. Next to the fly, in some localities, is the mosquito, but the following pages are devoted to the consideration of the fly. No more filthy creature than the common house fly can be imagined. It is born in filth, it lives upon filth and it carries filth and disease wherever it goes. It is one of the most dangerous pests and should be exterminated.

Life History of the Fly

For the following account of the life history of the fly we are indebted to *Bulletin Number 29* of the Illinois State Food Commission. It is so clear and direct that we are glad to give it in full.

"The fly lays its eggs where the conditions are best fitted for their development. These conditions are nearly ideal in stable manure. Flies also deposit their eggs in human manure and other forms of decaying and filthy vegetable and animal matter. Under ordinary conditions the eggs hatch into maggots, the larval stage, in from eight to twenty-four hours; these in turn develop into the pupa or resting stage. This period requires five to seven days. Finally the pupæ in five to seven days longer become fully developed flies. A generation of flies is therefore reared in from ten to fifteen days; ten to thirteen generations in one season.

"The number of eggs laid by an individual fly averages 120, and four such batches may be laid by each female fly. At this rate of increase, the one adult fly which we neglect to kill in early spring may be the cause of the existence of many millions of flies by August. This is the reason for the cry—SWAT THE FLY, AND SWAT HIM EARLY!

FIGURE 1

"It has been shown that as many as 685 maggots (the larvæ of flies) were present in one pound of horse manure. At this rate there would be 450,000 in a pile of 1000 pounds. Think of it; nearly half a million flies developing in one small manure pile."

Parts of the Fly

The illustration Figure 1 shows that the fly has a rather thick-set body, two wings and six legs. The large objects on

each side of the head are eye clusters, each containing 2000 or more facets. Between the eye clusters on the underside of the head is the tongue, or proboscis, with which the insect sucks up its food.

The parts in which we are particularly interested are the tongue and the feet. Figure 2 shows that the end of the tongue, C H, contains a number of stiff hairs. It is also covered with a sticky fluid, so that substances with which it comes in contact readily stick to it. The cut of the foot, Figure 3, shows two fleshy pads with rough under surfaces. These cushions or pads likewise secrete

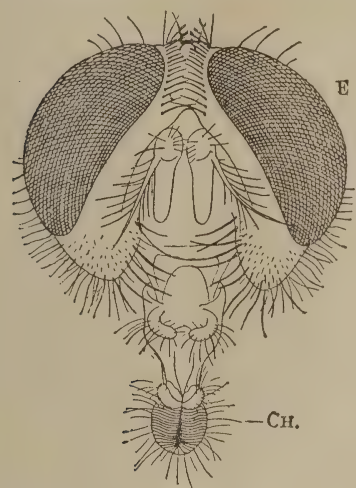


Figure 2

a sticky fluid by means of which the fly is able to walk on a vertical surface or even on the ceiling of a room. Any substance upon which the fly alights or over which it crawls readily sticks to these pads. Please remember that every fly has twelve of them, two for each of its six feet. Moreover, the body, legs and wings are covered with hairs, about 12,000 in all, and each carries more or less filth.

How the Fly Carries Disease

Flies obtain their food on the manure heap, in the privy vault and the spittoon, and from the food displayed in groceries and placed upon our tables.

All animal excretions contain germs which when they enter the human system may produce disease. The fly crawls over the manure heap, or visits the spittoon and then alights on the table, where it proceeds to wipe its feet on the butter and to bathe in the milk. It thus conveys the disease germs to the food, or it goes to the grocery and deposits the germs upon the articles of food exposed for sale.

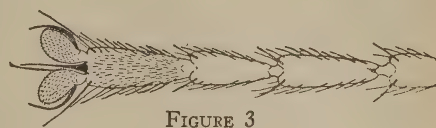


Figure 3

Many experiments have demonstrated beyond any question that flies are the most active carriers of typhoid fever, dysentery, tuberculosis (consumption) and infantile diarrhea.

They are not only a great annoyance to babies, but they are also dangerous to the baby's health. "Swat a fly and save a baby's life."

The Fly in the Home

Can anything more disgusting than the picture here presented be imagined? Yet this scene is being enacted every day in thousands of homes where little or no thought is given to its significance. The question is, What are *you* doing to destroy the flies in and about *your home?*

Start an Anti-Fly Campaign

If you have not already done so, begin at once to exterminate the fly. Act on the following suggestions:

1. *Use screens.* Screen the house and all places where food is manufactured, stored or offered for sale. See that all screens fit tightly.

2. *Keep your premises clean.* See that the alley and the back yard are kept free from refuse and all decayed material. Fit all garbage cans with tight covers, and keep these cans closed.

All places where food is handled must be kept scrupulously clean at all times.

3. *Use the swatter.* An effective and inexpensive swatter can be made by placing a piece of wire screen cloth four or five inches square in a cleft stick for a handle. When a fly gets into the house pursue it remorselessly.

4. *Care for manure.* Manure should be stored in such a way that flies cannot get to it. Horse manure is the most prolific breeding place for these insects, and it is impossible to rid your premises of flies if there are open heaps of manure near. Manure should be stored temporarily in a tight box and removed once or twice a week. When this is impossible, spraying thoroughly with a mixture prepared according to the following formula will destroy ninety-eight per cent of the larvæ.

FORMULA

Arsenite of soda	4 pounds.
Molasses	2 quarts.
Water	50 gallons.

Dissolve the arsenite of soda in the water; then stir in the molasses.

Spray over the manure pile, using any of the common forms of garden sprays.

Arsenite of soda costs ten to twenty cents a pound, depending on the quantity purchased.

Arsenite of soda is an *active poison* and must be kept out of reach of children and stock.

5. *Fly paper.* The *Illinois Bulletin* gives the following directions for making a successful sticky fly paper:

Take two pounds of rosin and one pint of castor-oil, heat together until it looks like molasses. Take an ordinary paint brush and smear while hot on any kind of paper—an old newspaper is good—and place several about the room. A dozen of these may be made at a cost of one cent.

Cautions

If you care for your own health and the health of your children:

1. Don't buy food from any dealer who refuses to fight the fly.

2. Don't purchase fruits or vegetables offered for sale unscreened.

3. Don't patronize any dealer who hauls your food through the streets and alleys unprotected.

4. Don't eat fresh fruits without thoroughly washing or peeling them.

5. Don't keep garbage or refuse around the house.

6. Don't throw dish water and similar slops in the yard as this "DRAWS" flies.

7. Don't allow flies to get on baby.

8. Don't allow your neighbor to be careless as to flies.

9. Don't forget to notify the local health officer of any fly nuisance.

—*Illinois State Food Commission.*

FLY CATECHISM

1. Where is the fly born? In manure and filth.

2. Where does the fly live? In all kinds of filth and he carries filth on his feet and wings.

3. Where does the fly go when he leaves the manure pile, the privy vault and the spittoon? He goes into the kitchen, the dining room and the store.

4. What does the fly do there? He walks on the bread, fruit and vegetables; he wipes his feet on the butter and he bathes in the milk.

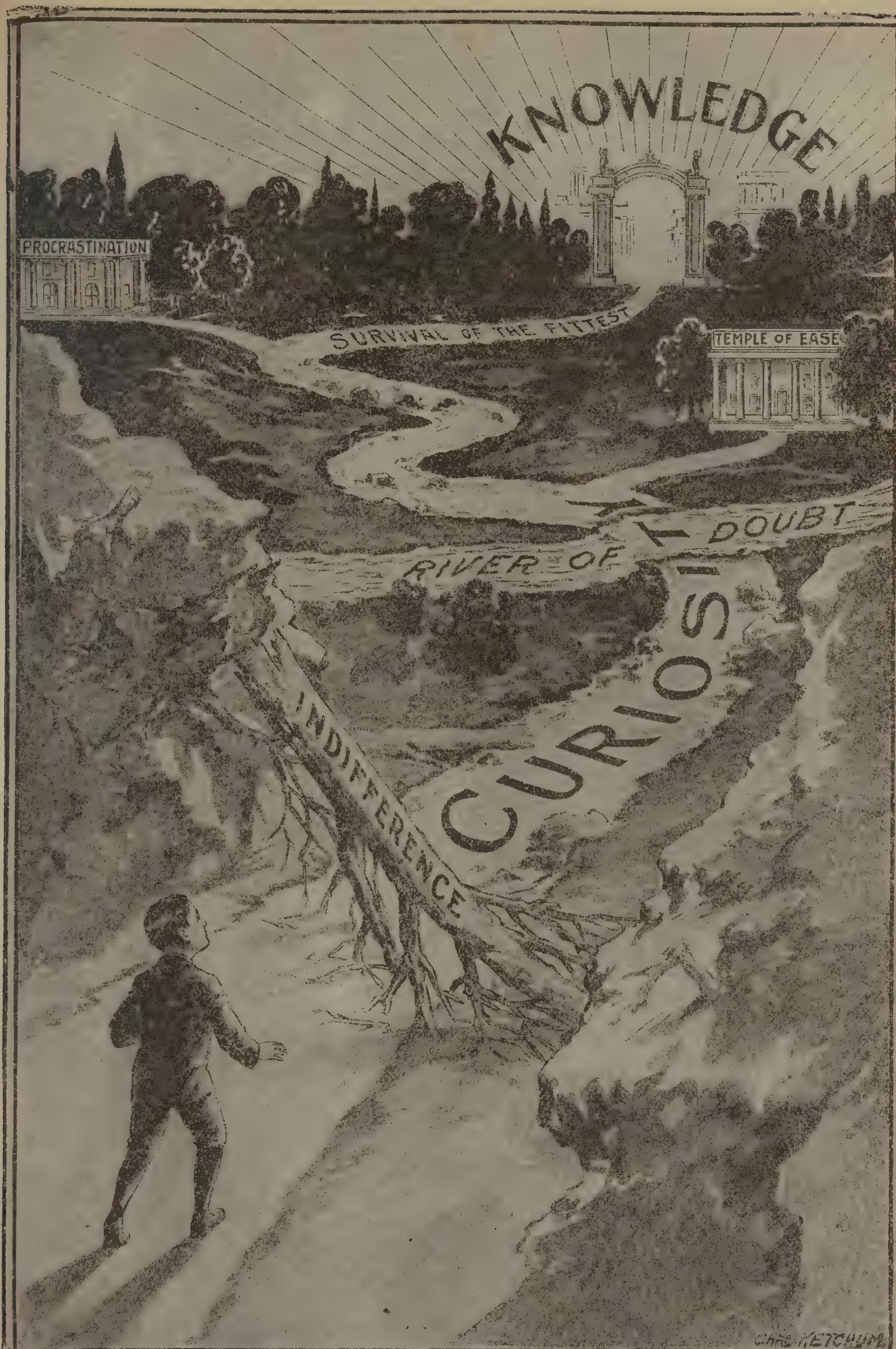
5. Does the fly visit patients sick with consumption, typhoid fever and cholera infantum? He does and he may call on you next, carrying infection.

6. What diseases does the fly carry? Typhoid fever, consumption, diarrheal diseases, diphtheria, scarlet fever and in fact any communicable disease.

7. How can the fly be prevented? By destroying all the filth about your premises; screen the privy vault; cover the manure bin; burn all waste matter; destroy your garbage; screen your house.

Either man must kill the fly or the fly will kill man. Prevent the Fly!

—*Indiana State Board of Health.*


KNOWLEDGE
PROCRASTINATION
SURVIVAL OF THE FITTEST
TEMPLE OF EASE
RIVER OF DOUBT
CURIOSITY
INDIFFERENCE
CHAS KETCHUM.

Curiosity Department

Runners in the Race

The champion runners in the race for learning are not found in university and college halls. They are in the homes of rich and poor alike, wherever children are laughing and playing. Their achievements are indeed marvelous. In a few short years they master a complicated language and lay the foundation on which all further advance is based. In that brief period, then, they traverse the arc of progress for which the race in its infancy required thousands of years. Never in after life will their progress be, relatively, as rapid, though the world may resound with their achievements in science and art.

The Question-Asking Age

Curiosity is very active during these happy, care-free years that may be called the question-asking period of life. To serve her purpose, nature makes curiosity the great incentive to action. There is so much to learn that she sends the youthful seeker to parents, companions, teachers, and friends for aid. The days begin and end with question marks.

As the years pass and knowledge increases, the glow of inspiration grows dim and, save in exceptional cases, or in one or two directions only, or when under the lash of necessity, further advance is sluggish, lacking the torrent-like rush of youthful years.

In Childhood Days

To the child, every day is one of discovery, of exploration in new fields. The rising and setting sun, the changing seasons, summer flowers and winter snow, singing birds and ripening fruits, are all so many items of mysterious knowledge about which he must be informed; and the little traveler boldly ventures forth on the sea of childish speculation if denied the aid of mature minds. Long before we grown-ups think possible, he is puzzling over questions that many persons of liberal education can not answer.

Parents' Opportunity

Parents do not realize what a wonderful privilege is theirs to influence the little mind that so confidingly trusts in them. If they repress childish curiosity and either can not or will not aid in his quest, they are liable to dwarf his entire after-development and make it difficult for the child to take that place in the activities of the world to which he is entitled. He can not play his part unless possessed of requisite knowledge, and he needs for such acquisition all the enthusiasm of youth and the helpful activity of curiosity. It is the parents' privilege to assist, to guide, to control this helpful faculty of youth that, like every other faculty, needs control, else, like a mountain torrent, it may wreck

and ruin where it should perform a beneficent work.

Our Purpose

We believe that children are entitled to a department of Questions and Answers, such as we have here prepared for their own use. These questions treat of all the activities of youthful life, all that arrests the children's attention during the day, their plays as well as more serious problems. The answers are written, not for learned people, but for bright, active, curious children; for whose minds knowledge that can be easily understood is just as essential as nourishing food for their bodies. We are confident that teachers, fathers, and mothers, not less than young folks, will welcome this department; and while it is prepared especially for children, we want parents and teachers to aid them to secure its benefits. From the ranks of the children of today will come, in a few short years, the active, professional and business men and women of the future. Let us help children to become such by assisting nature to make more effective the wonderful, stimulating work of curiosity.

Where Do the Days Begin?

Of course, you know we have different kinds of time in this country. When it is noon at Chicago, it is one o'clock in the afternoon at Washington, but eleven o'clock in the forenoon at Denver.

Now, suppose you went to bed in Chicago at nine o'clock Sunday night. If you could jump to San Francisco in an instant, you would find it was only seven o'clock Sunday evening. Then if, the next minute, you could jump two thousand miles further west to the Sandwich Islands, you find it only half-past four Sunday afternoon. If your next jump in less than a minute's time could be to Manila, in the Philippine Islands, you would find it eleven o'clock in the forenoon, but the people would be calling it Monday.

Somewhere, then, between the Sandwich Islands and Manila, the people stopped calling it Sunday and commenced to call it Monday. Our travelers and scholars, and learned men generally, have agreed, for the sake of convenience, to take a line just half-way around the earth from London, or rather from Greenwich, near London (that is 180 degrees west or east from Greenwich) and call it the date line. If you will look it up in your geography, you will find it runs north and south across the Pacific Ocean. But for many good reasons, the line taken does not run exactly north and south, but bends in places so as to dodge islands, as it would never do to have different days on the same island, for the people would be all mixed up. There are, however, very few islands in the way. We may say, then, that the days begin and end at the date line in the Pacific Ocean, half-way around the earth in either direction from Greenwich, near London. One curious result is this: If you were taking a voyage to Japan or Manila you might possibly go to bed Monday night but when you went on deck in the morning you would find it Wednesday; or just the reverse might happen if you were coming from Japan to the United States—you might go to bed Monday night but the next morning you would find it Monday again. Of course, the days do not really begin at the date line, any more than anywhere else, but for countless reasons we have to choose some place to make this change, and that line is the one selected.

Where Did the Days Get Their Names?

We name one city Chicago; another, Washington; still another, New York, so that we may know about what city people are talking. For the same reason the seven days of the week are given names. If you say, "I went fishing last Monday," everyone knows what day you mean. All the great nations have adopted names for the days. The names are not quite the same, because, you

know, people use different languages, but they generally resemble each other in sound. Just as the name "John" is not quite the same in English and German but they resemble each other. In this country we use the English names of the days, which are somewhat the same over all Europe, for we all form one large family of people. Since the names go back to very old times and had to be names well known, people took for that purpose the names of some of the gods of heathen times. The sun and the moon being worshiped, we have a Sun's day and a Moon's day, which have become the two first days of the week. Then there was a war god of the early Germans called Tiu, and Tuesday was named after him. Wednesday is named after Woden, Thursday after Thor, and Friday after Frigga; these were gods of the people in the north of Europe. Saturday is named after Saturn, one of the Greek gods. Now you can tell the heathen god in honor of whom the day on which you read this answer was named.

What Makes It Dark by Night But Light by Day?

On a hot day you like to get in the shade because the light and heat of the sun do not directly strike you. But it is only a few feet to where the sunlight could reach you and you can see perfectly well. But suppose the shade was so big that it was hundreds and hundreds of miles to the light. It would be so dark you could not see. That is what happens at night. The earth on which we live is constantly turning round and at night you are on the side turned away from the sun. You are in the shadow of the earth, just as you were in the shadow of the house; but this time it is a very large shadow, and, as the night passes on to midnight, it gets larger and larger where you are and it is hundreds and thousands of miles to the sunlight and so it is dark. But after midnight the sunlight is coming nearer and nearer, and when morning comes the shade is gone and it is light. Where you live, when are the nights the shortest of the year? When the longest? Do you know any place where there is but one day and night during the year?

What Makes Some Days Warmer Than Others?

When we first think about it, it does seem as if the days of a week, say in June, ought to be of the same temperature (the same in heat or cold), but we know it is not so, since one day may be uncomfortably warm but the very next one so cool that we almost need a fire. No one knows all the reasons for temperature changing in this way. All the heat on the surface of the earth depends, finally, on the sun, and conditions on the sun's surface are constantly changing, never the same from day to day, and we do not understand all these changes.

One of the very latest things we have discovered is that there are places on the surface of the sun that radiate (send to us) more heat than others, and such sections constantly vary in size, form and disappear, and are not confined to the same part of the surface; consequently, the volumes of electricity and heat that constantly stream out from the sun to the earth are not the same from day to day, and thus the mysterious changes on the surface of the sun influence, in a way not yet fully understood, the warmth of the weather.

Speaking generally, the weather depends on the currents of air. We do not understand all the influences which cause the air currents to flow as they do. If they come from the north, or across large bodies of water their temperature may be greatly different from what it is if they come from the south, or across a heated desert or a level stretch of country. Does this help you to understand why it may be raining in the morning some winter day, but sleeting a few hours later, perhaps turning to snow still later, all the same day?

How Does a Toad Catch Flies?

The toad is always hungry. His gastronomic ability is so great that he must have four meals per day to be happy. He must, therefore, hunt and eat almost incessantly to get as much as he needs.

The tongue of the toad, with which he catches his food, is admirably adapted to its work. It has a sticky surface, and is fastened at the front instead of at the back. This latter fact makes it possible for the toad to throw the tongue well out of the mouth.

The toad eats almost all kinds of small living things. He sits with head bent forward and eyes looking very bright and intelligent. When he sees a fly light within two inches of his nose, he makes

no preceptible movement of the head or body. The mouth opens and the fly is gone. When the fly lights farther away, the toad springs forward on his strong hind legs, then easily slips back into a sitting position. That is all we can see, but, again, the fly is gone.

How Does a Toad Drink?

Water is necessary to the existence of a toad and they will cross a large field in search of it. Toads have been known to go a year without food and again to perish in a day without water. And yet this little creature never drinks as we drink. Instead of drinking they soak. Just like a sponge they sprawl out on their big expansive bellies and soak themselves full.

Did You Ever See a Toad Go To Bed?

After a toad has had a fine night's hunting among the vines and bushes, and is full of bugs and worms, he proceeds at once to kick himself into bed. He backs and kicks and elbows into the loose sand as far as he can, then screws and twists till he is worked out of sight beneath the soil, hind end foremost. There he lies, with only his big pop eyes sticking out, half asleep, half awake. If a hungry snake crawls along, he simply pulls in his eyes, the loose dirt falls over them, and the snake passes on.

Where Does The Toad Sleep in Winter?

When the nights grow chilly and there are threatenings of frost, the toads hunt up winter quarters, and hide deep down in some warm burrow till it gets warm again, whether that time be tomorrow or next April. Toads and frogs are cold-blooded, that is, their temperature changes with the changes in the temperature of the air about them—hotter as the heat of the day and season increases, and colder as the air grows colder. Warm blooded animals maintain an even temperature in their blood. Thus the warm blooded animals are not so quickly affected by weather changes, but on the other hand they cannot endure the very low temperatures that the cold blooded animals can, and live. Instead of fighting the cold, the toads yield to it and soon suspends living operations altogether, all heart action ceasing, the blood in the heart even falling below freezing; yet thawing out again, and life coming back with returning warmth. (See p. 3421.)

Do Some Plants Eat Insects?

Certain plants of the pitcher plant family do eat insects. In many respects they are the most interesting and curiosity exciting of our wild plants. It would perhaps be better to say that they "absorb" insects rather than that they "eat" them. The leaves of these plants are long and tubular, and form a sort of

pitcher which is generally half filled with water. The inner side of the pitcher is covered with fine hairy bristles which point downward. Just inside the pitcher is secreted a sweet, sticky substance which is supposed to attract insects. Once inside the pitcher, the insect becomes a captive, the hairs preventing its escape, and falls exhausted into the water, where it finally drowns, and its body is absorbed. Do you recall the curious flower, Jack the preacher, we met in our spring ramble? (p. 3428.) You know he was in this line of work. Mother Nature provides for the wants of all her children, but she gives boys and girls brains and expects them to find ways of supplying their own needs.

What Little Insect Was Necessary Before Red Clover Could Be Raised In Australia?

Some years ago, an attempt was made to introduce our common red clover into Australia. A quantity was planted, and responded with a vigor of growth that was surprising. But the seed product was a failure. Investigation resulted in the introduction of a number of our common and familiar big bumble bees, whose liberation among the clover blooms of the next planting resulted in perfecting the production of seed. The bumble bee was the direct means of transferring the pollen from flower to flower and in this way assisting in the fertilization. Did you ever rob a bumble bee's nest? It is fun—sometimes. It seems that the bumble bee is a hard working, useful member of the insect world. He not only acts as messenger boy to the red clover, but you recall in our summer ramble he accommodated the milkweed in the same way. (p. 3440.) It seems a pity to rob his nest. He has fairly earned a modest home by hard work and faithful service.

Why Do Some Flowers Bloom Only At Night?

Such flowers are so constructed that they can be fertilized only by night-flying moths or by other insects which do not fly about in the daytime. Night-blooming flowers are very often large and white, to attract the insects. Here is a question for you. It seems that flowers and insects help each other out. Both are necessary for each others well being. The flowers furnish honey or food, and the insects carry pollen. Which was first, the night flying insects, or the night blooming flowers?

How Fast Can Birds Fly?

Few exact figures are available, but it is probable that the highest speed is nearer 50 than 100 miles an hour, although the latter figure is often claimed. Endurance on the wing is more remarkable. Many sea-birds seem tireless, the swallows are almost incessantly in the air. During migrations a large variety of birds, including some of the smallest and feeblest, undertake extensive journeys, reaching in some cases almost half around the world. You will note that our flying machines can fly faster than most birds. But is the flying of an airplane in any respect like the flight of birds? You have seen hawks sailing round and round; is their flight on the same principle as that of the airplane? (See p. 24.) You recall that we made the acquaintance of a number of bird travelers in our spring rambles (p. 3404, 3406) and don't forget the Flying Harrow. (p. 3446.)

What Wild Flower Gives One Blossom To The Flower Picker and Keeps Another Underground For Itself?

The fringed polygala has a curious underground flower which ripens its seeds by self-fertilization. In this way new plants are insured; for if by any chance the upper flower should fail to produce seeds, the groundling seeds would sprout anyway. In our spring ramble we found a flower—wild ginger—that was even more curious, for the only flower it had was underground or at least tried to cover itself with dirt.

(p. 3429.) Mother Nature's floral children differ from each other in many ways.

Why Does An Engine Puff When It Is Standing Still?

Because an automatic pump is at work filling the air-brake tanks with compressed air. Just after a train has come to a standstill the compressed air is pretty well exhausted from operating the brakes under each car of the train, and the puffing of the air pump is rapid. As the tanks fill, the pumping gradually becomes slower. Is the air that you breathe compressed at all? By what? Would an engine work harder on top of the Rocky Mountains than at the sea shore?

Why Does a Bicycle Bell Sound Higher in Pitch When Coming Toward You Than When Receding?

The pitch of the bell depends upon the number of vibrations reaching the ear per second. The approaching bell crowds the vibrations on the ear, while the receding bell draws the vibrations out and lengthens them. Suppose all bicycle bells had the same pitch when they are standing still. Could you tell when you heard one whether it was coming toward you or not? Remember this when you come to study astronomy and the spectroscope.

How Did The United States Get The Nickname of "Uncle Sam"?

During the war of 1812 our Government had a contract with Elbert Anderson to furnish army supplies, and the inspector appointed to pass on the goods was a jolly man known as "Uncle Sam," his name being Samuel Wilson. He inspected the boxes, and if they were all right marked them with the letters "E. A.—U. S.," the initials of the contractor and the United States. When the marker was asked one day what these letters stood for, he jokingly replied, "For Elbert Anderson and Uncle Sam." This was spread as a good joke, and it became common to refer to all packages marked U. S. as belonging to Uncle Sam.

Why Do Waves Break on The Seashore?

Water in motion will always dash against any resisting surface and fall back. On a long, sloping beach the friction at the base of a wave will retard it, so that while the top is moving along, the bottom is held back. This makes the top of the wave curve in a crest which will finally fall over and break. In breaking, the crest lets in air particles which make bubbles of white foam.

How Does a Tall Tree Carry Water Up To Its Top?

This is a very difficult question and botanists are not agreed as to just how the water is carried up to such a height. It cannot be by ordinary pumping action, because a pump will raise water only twenty-eight feet. The force of "capillarity," which makes oil rise in a lamp wick, cannot pull water up so high. The living cells in the wood and in the leaves are probably able to form in some way a series of little pumps and thus to draw the water up very high.

When Were Fans First Used?

Early Egyptian paintings as well as ancient Indian and Chinese drawings show that the use of the fan dates back to primitive times. Fans were used in India and China to keep flies off the sacred offerings in the temple, and later as hand implements for cooling the air. One of our pictures of Oriental luxury is of princes and fine ladies lying or sitting in state, while attendants fan them. These early fans were usually made of plumes, the wings of birds being the models. The folding fan is said to have been a Japanese invention, made in imitation of the wing of a bat. It was introduced into Europe in the Middle Ages, and the highly decorated fan became a much-

prized luxury. Painters, of whom Watteau is the most familiar, did some of their most beautiful work on fans. Fans with shepherds and shepherdesses dancing on the green are typical of this period. What mechanical fan is in common use today?

What Is The Origin of The Nickname "Brother Jonathan"?

Once when General Washington needed ammunition, he called a council of officers, and when no one had any suggestion to make, he said, "We must consult Brother Jonathan," referring to Governor John Turnbull of Connecticut. This patriot helped them out; and afterwards in emergencies it became common to say that "Brother Jonathan" must be consulted. Gradually the government itself was called "Brother Jonathan." By the way, during what war was this?

Why Did Old-Fashioned Watches Run Fast in Cold Weather and Slow In Warm?

They ran fast in cold weather because the escapement wheel, the small wheel which spins back and forth and governs the speed of the watch, would contract from the low temperature and thus spin faster. In warm weather the escapement wheel would expand and spin more slowly. The modern escapement wheel has its rim in two or more sections, each section being fastened at one end only. Each section is also formed of two metals, the expansion and contraction of which tend to counter-balance each other, when properly arranged.

How Fast Does The Air Move When The Wind Is Blowing?

When the wind blows gently and makes the leaves of trees move slightly, the air is moving five or six miles an hour; when the branches of trees sway slightly, about fifteen miles an hour; and when the large branches are moved, about twenty-five to thirty miles an hour. When small objects like sticks are blown along the ground and a person finds it difficult to walk against the wind and umbrellas are turned inside out, the air is moving at a speed of from forty to fifty miles an hour. When heavy objects are blown about, chimneys are blown over, signs are torn loose, and it is difficult to stand upright, the wind is blowing from fifty-five to seventy miles an hour. The speed of the wind seldom exceeds seventy miles an hour even in the great storms that ravage the coast, but in hurricanes it will blow at ninety or one hundred miles an hour.

How Do Animals Sleep?

All animals sleep, but many of them in ways so curious that they seem to be awake. Ducks sleep on open water, and to keep from drifting ashore paddle with one foot continually, thus traveling in a slow circle. Bats sleep head downward, hanging by their hind claws. Some birds sleep with their heads turned backward and tucked under their wings. In addition to their eyelids, owls have a curtain which they draw sidewise over their eyes. Many animals of the cat kind sleep with wide-open, staring eyes. Elephants sleep standing up, their heads slowly swinging as if they were awake. It is these and other curious attitudes that give rise to the stories that some animals do not sleep.

Can You See The Wind?

You have probably noticed the quivering air rising from a hot stove or a steam radiator or even from the road on a very hot day. You were seeing the air then. If you want to see the wind, take an ordinary saw and hold it with toothed edge upward and across the wind. Then squint along the edge of the saw, and you will see the same quivering effect that is mentioned above; this is the wind passing over the saw edge.

What Animal Is Considered a Weather Prophet?

Early in the autumn the wood chuck (or ground hog) goes to sleep in his winter quarters. He curls himself up in a little ball, with his nose under his paws so that he can keep his toes warm by breathing on them. Here he sleeps snugly all winter, and then, so the story goes, he wakes up suddenly on February 2, stretches himself, rubs his eyes, and at last creeps out of his cozy nest to see what it looks like outdoors. If he finds it cold and wet, the earth covered with snow, and heavy gray clouds hanging low in the sky, he begins to look around, for he feels certain that soon the ground will be warm, and the little birds will be coming out, for Spring is surely on her way. But if the sun is shining brightly and the first thing he sees as he leaves his burrow is his own shadow, he pops back into it as fast as he can, once more tucks his nose under his paws, and settles down for another six weeks' nap, for a cold late season is the only result that can be expected. It must be confessed that he doesn't always get it just right, but then the very best of us make mistakes at times.

Are Guinea Pigs Really Pigs?

Perhaps many of you have read that interesting book called "Pigs is Pigs," or maybe you have seen it in moving pictures. But, guinea pigs are not pigs at all, and there is no reason for giving them such a name. They are properly called "cavies," and they came originally from South America. Do you know of any other somewhat similar mistake. Is a seal a fish? Is a bat a bird? Is a pineapple an apple?

How Fast Does Rain Fall?

When the rainfall is so slight that it "sprinkles," the actual amount of water may not cover the ground to a greater depth than the one-hundredth part of an inch. In a hard shower, lasting half an hour, the rain falls to a depth of from half an inch to an inch. In a long-continued rainstorm, lasting a day or two,

three or four inches of rain may fall; but in special instances enormous quantities of rain have fallen within brief periods. Thus in Louisiana a rainfall of 21.5 inches within twenty-four hours has occurred; in Japan as much as 29.5 inches has fallen in a day; and in India 39.5 inches fell in twenty-four hours, which is about as much as falls in the eastern United States in a whole year.

How Does Rain Happen to Fall in Drops?

When the minute particles of water that make a mist or cloud are carried in various directions by the air motions, and in this movement come in contact with each other, they unite to form globules which are too heavy to be supported by the air and therefore fall. The larger the raindrops formed, the more rapid is their fall. When they are blown about in the air for a considerable time before they fall to the ground, raindrops of very large size may be formed. Electrical action also plays an important part in the formation of raindrops from cloud particles.

Why Does a Boy's Voice Break, While That of a Girl Does Not?

As a boy approaches maturity, his larynx enlarges. During the period of its growth, his vocal cords are not under perfect control, and his voice will break. A girl's larynx does not enlarge in the same manner, but only gradually with her growth, so that there is no time when her vocal cords are suddenly altered. (See Larynx, p. 1593.)

What Insect Lives in a House Made of Bubbles?

In every field and meadow during June and July, bubble houses may be seen attached to the stems of grasses or weeds. Underneath each pile of bubbles, with its beak embedded in the stem, a little green bug is sucking the juices of the plant. He takes in such quantities of sap that it oozes out all over his body in little bubbles. This protects him from the sun until he has grown into a mature "frog hopper."

What Insect Looks Like a Lobster and Takes Long Journeys on a Fly's Leg?

The false scorpion, a tiny insect no larger than a pinhead, lives in dusty corners among old books and papers. He has a great passion for traveling, and when the first roving fly comes near, he will at once seize one of the fly's legs with his long lobster-shaped claws, and go sailing off through space dangling from the fly's foot.

What Fish Lays Its Eggs on a Rock and Then Goes to Live in an Old Tin Can?

After the female toadfish has laid her eggs, she finds some old tin can, or even an old shoe, crawls in, and with her mouth at the opening, stays there for the rest of the season, leaving her family to shift for itself.

What Duck Lays Its Eggs in Trees?

The wood duck makes its nest in the limbs of a tree near a pond or stream and hatches its young there. The manner in which the ducklings are transported to the water has long been a question in dispute, but within a few days they are to be seen swimming. This duck is the most beautiful duck found on the American continent and much resembles the mandarin duck of the Orient.

Why Do Flowers Fade?

Flowers are put out by plants for the purpose of perfecting seed, which in its turn will produce new plants and flowers. The bright colors and perfumes attract the insects, which bring pollen to make the seeds fertile. When this has been done the need for the petals is gone. The plant calls its life-giving juices back into stalk and leaves, and the petals wither away. You must

read about petals and flowers in the article on botany.

When Was Croquet First Played?

Croquet is the descendant of an old English game called "pall-mall," which was popular in England up to 1700. It was much played in London and gave its name to the famous street, Pall Mall. It died out entirely, but was revived in the middle of the nineteenth century from a remote part of Ireland, where it had been played through all the hundred and fifty years. Croquet was very popular for many years, but has been somewhat superseded by tennis.

Where Did We Get the Game of Golf?

From Scotland, where it was known as "gouff" probably from the Scotch word meaning a "blow" or a "stroke." Golf is also said to be of Dutch origin, as a game of this nature called "kolf" was played hundreds of years ago in Holland and Belgium, usually on the ice. We know that it was played in Scotland as early as 1457, for at that time the local Parliament made laws about its abuse.

Who Brought the Soft Felt Hat to America?

The famous Hungarian patriot, Kossuth, was responsible, it is said, for the soft felt hat in America. When he came to the United States in 1849, he wore a large, soft hat instead of the usual silk hat, or beaver, and the "Kossuth" immediately became popular.

When Were Gloves First Worn?

Gloves date back surprisingly far in history. Laertes, father of Ulysses, is described in Greek legend as wearing gloves when farming to protect his hands from thorns. Xenophon scoffs at the Persians as effeminate because they covered their hands with gloves. In the Middle Ages they were a common article of dress. Kings and nobles always wore long, thick gloves which were richly embroidered in gold or studded with precious stones. The ladies of the court also wore beautifully decorated gloves. We are all familiar with the custom by which a knight wore his lady's glove on his helmet as a mark of his allegiance to her and as a token of her gracious favor shown to him. The gloves which knights wore in combat were gauntlets of mail. To throw one down was the common way of challenging a duel.

How Can Light Be Heard By the Blind?

It is only in this wonderful twentieth century that the idea has been conceived of translating light waves into sound waves, so that a blind man can read by sound. The particular invention which claims to enable a blind man to read his newspaper by listening to it is called the "optophone." This device consists of a perforated disk which rotates in front of a powerful lamp. The type to be read is placed facing the light upon a rest. A small, intensely bright line of light, passing through the holes in the disk, travels from one letter to the next, and the type reflects the light on a selenium bridge. Each letter gives a characteristic sound, heard by means of a telephone. Learning the sound of each letter, the blind person can follow the text.

How Does the Optophone Work?

It is really the selenium bridge which makes this device possible. To translate light into sound some substance must be used that is affected immediately by light playing upon it. Selenium stands alone in having the property of changing its resistance to the flow of electricity, according to the intensity of light striking it. Using selenium with graphite for the ends of the small wires, a cell may be constructed so sensitive that when rays of light strike it, an electric connection will show the slightest variations and gradations in the rays and thus change them into sound. This same principle is used in telegraphing a picture. In this way

a picture, say of a distinguished man, can be telegraphed hundreds of miles and there be reproduced with surprising fidelity.

What Causes Leaves to Fall in the Autumn?

Leaves do not fall through the action of frost alone. During August and September a thin layer of corky cells forms at the point where the leaf stem joins the twig. As the season advances this layer separates into two circular layers, leaving only the central bundle of veins to hold the leaf. Then, with the first strong wind, or a frost, this bundle is torn apart and the leaf falls. You notice that the leaves have done their year's work. They have supported the life of the tree, provided for its growth, not until then are they dismissed by Mother Nature from her service.

Why Do Ashes, Spread Over a Fire, Help Keep It?

Ashes are porous, and when spread over a fire, allow air to reach the live coals in quantity sufficient only for very slow combustion, thus prolonging the life of the fire.

Why Do Some Bulbs Bloom in Water Without Earth?

Some bulbs, like the narcissus, are very large in proportion to the rest of the plant. They are packed with food material, and when the bulb is put in water, and thus provided with the necessary moisture, they have sufficient food elements to produce leaves and blossoms without soil.

Why Does Boiling Water Stay at the Same Temperature Instead of Becoming Hotter?

After the boiling point is reached, all the heat is used in changing the water into steam. More than five hundred times as much heat is required to change a given quantity of water into steam as to warm it one degree Centigrade. Do you have a gas stove in your house? When the water in which potatoes are placed is boiling, will they be done sooner by turning the gas up?

Why Do Weeds Thrive Better Than Cultivated Plants?

Weeds are plants which have had to shift for themselves ever since Mother Nature formed them, and only those which were well able to take care of themselves have survived. Cultivated plants have always been taken care of by man, and are therefore much less hardy. It is much as if Mother Nature says, "if you want my plant children to produce fruits and grains for you, you must take good care of them. I will turn that part of my work over to you."

How Can the Mississippi River Flow Uphill?

The source of the Mississippi is so far north that it is in the region where the flatness of the poles begins. Accordingly this region is not so far from the earth's center as the region at the mouth of the river much further south. So, of course, as the river flows south it flows farther and farther from the center of the earth, or up hill. It is able to do so because the farther south it goes, the faster the surface is turning around under it and the water tends to fly away from the center.

Who Made the First Sandwiches?

The Earl of Sandwich in England, who was so great a gambler that in order to save time he is said to have formed the habit of putting a piece of meat between two slices of bread, which he could eat without leaving the gambling table. Hence, so the story goes, the name "sandwich."

What Was the First Book Ever Printed in America?

The first book to be printed in the English-American colonies was the Bay Psalm Book, which is now very rare,

and is much sought by collectors. It was printed by Stephen Daye at Cambridge in 1640, and was used by the early colonists.

How Far Can the Eye See?

There is no definite limit to the reach of our vision. We can see as far as light will travel, but the space between must be unobstructed, and the object must be sufficiently large not to be reduced to invisibility by perspective. We see stars that are millions of miles away. Because of the curvature of the earth's surface, we can see only a comparatively short distance on its surface, unless we are on an elevation or looking at a very high object such as a mountain.

An object one foot high can be seen in clear weather 1.31 miles; a 5-foot object 2.96 miles; a 10-foot object 4.18 miles; a 25-foot object 6.61 miles; a 100-foot object 13¼ miles. If a modern ocean liner, say one 950 feet in length, were to be stood on end upon the surface of the ocean, it could be seen at a distance of thirty-three miles. When you look at the moon, how far are you looking? When you look at the sun?

How Can There Be Hot Springs in Iceland?

Part of Iceland is of volcanic origin, and in several of the mountains eruptions have occurred within the last four hundred years. In the southwest, in particular, there are many hot springs, over which food can be cooked. Do you know of any of our states that possess hot springs? The temperature of the surface of the earth affects the crust for a short distance only; volcanic actions come from deep within the earth, and are not influenced by conditions on the surface.

How Can You Tell the Speed of a Railway Train?

Every time the car wheel passes over a rail joint it makes a click. Count the number of clicks in twenty seconds, and you will get the number of miles the train is going an hour, or so near that it makes no difference. When you are farther advanced in arithmetic, figure out the problem of why.

How Can a Sound Break a Pane of Glass?

We all know that a sudden jar will break a flat piece of glass. Sound waves caused by an explosion of dynamite or some similar violent disturbance will sometimes break against a window miles away with sufficient force to shatter the glass. This means that the vibrations of the air have carried the effect of the commotion faster and farther than it has been conveyed by the solid particles of the ground.

What Animal Carries Its House On Its Back and Has Eyes On the Ends of Its Horns?

The snail has on its back a shell into which it can withdraw its body, and at the tips of its two longest stalks or horns are found its eyes. The shell of the snail is made and mended by a juice from its body which is at first sticky and then hardens into shell. How do

you think the snail pulls himself into the shell? Have you a rubber glove? You can push a finger part back into the hand part, and then you can crowd it all into a small ball. In the same way, the snail can pull his head part and his horns into his stomach part and then by means of strong cords draw it all up into the shell. Do you see why the snail is called a stomach walking animal?

How Can You Make a String Telephone?

The string telephone depends on the power of sound to travel through solid bodies. Take two empty tin cans or gas-mantle boxes and a hundred feet or so of ordinary string. Punch a small hole in the center of the bottom of each can. Pass an end of the string through the hole and knot it securely. Then stretch the string taut, and you have an efficient little telephone which will work very well between two houses that are not too far apart.

Why Do Farmers Plant Clover on a Field and Then Plow It Under?

On the clover roots are colonies of tiny bacteria, which are able to take nitrogen directly from the air and to convert it into valuable plant food. Ordinary plants cannot take their nitrogen from the air, but must get it in the form of salts from the soil. You will be interested in reading about fertilizers in agriculture.

How Cold and How Hot Does It Get?

The temperature of the air—that is the reading of the thermometer when placed in the shade—varies not only from hour to hour but also from month to month. The least variation is found on the oceans in the tropics; the greatest is observed in the interior of a continent.

The lowest temperature yet observed near the ground was at Werchojansk, Siberia, where the temperature fell to 90 degrees Fahrenheit below zero in winter. In the same place it has also become as warm as 86 degrees Fahrenheit in summer. This makes a change of 176 degrees Fahrenheit during the year. As a contrast to this wide range is the climate of the island of Madeira, where the change between the highest and lowest temperatures amounted to only 11 degrees Fahrenheit during a year.

In the United States the lowest temperature yet observed was 63 degrees Fahrenheit below zero, in Montana. On Mt. Washington the thermometer has read 50 degrees below zero; on Pike's Peak, 40 degrees below zero. In the desert region of Southeastern California and Southwestern Arizona, one of the hottest regions on the earth, the highest temperatures are about 122 degrees Fahrenheit in the shade. In Western Dakota the total change in the air temperature during the year amounts to almost as much as that noted in Siberia, the range being 170 degrees in some places. What is the source of all heat on the earth's surface? What is the difference between heat and cold?

How Is Air Made Liquid?

It is hard to believe that the air which we breathe can be changed into a liquid, and yet liquid air is in frequent use in chemical laboratories. We are familiar with the idea of changing water to a solid by cooling it, or to a vapor by heating it. All matter is in a solid, liquid, or gaseous state according to temperature and pressure, and substances differ widely in the degree of heat or cold required to change them from one state to the other. Air is a mixture of gases and may therefore be liquefied, but it must be cooled to 310 degrees Fahrenheit below zero and subjected to pressure. Thus while water to become a gas must be heated to 212 degrees Fahrenheit above zero, air must be cooled to a temperature even farther below zero, to liquefy it. To achieve this low temperature, use is made of the fact that when a gas expands rapidly it loses heat. The air is compressed to a very high pressure and then allowed suddenly to expand, thus cooling it. Doing this once would not reduce the temperature sufficiently, but by letting the cooled air on its way out from the vessel pass over the pipe through which more air is entering, the incoming air will be cooled to a point where, when it in its turn expans, above five per cent of it will liquefy.

How Can Air Boil?

In the problem of storing this liquid air we come across another of its astonishing properties. Its boiling point is 310 degrees Fahrenheit, below zero. Even with the slight amount of heat that will reach it in a double-walled flask made on the principle of a thermos bottle with a vacuum between the walls it will promptly begin to "boil." So fast will it boil—away down three hundred and more degrees below our freezing point of water—that, if an outlet were not left for the escape of the gases given off in boiling, it would blow the vessel to pieces. Even with the utmost care, all of the liquid air in the vessel will boil away in a few days.

When Was the Magnetic Compass First Known in Europe?

During the twelfth century it was brought to Europe by Crusaders, who had obtained it from Arabian traders in Eastern waters. When first brought to England, no one dared to use it, lest he should be accused of witchcraft. It was also thought that sailors would not go in a ship whose captain had an instrument, which, from its strange and wonderful qualities, might possibly be the work of evil spirits. The compass came into general use late in the thirteenth century. (See in Volume II, page 5, the story of the era which was ushered in by the mariner's compass).

How Are Pins Made?

It is hard to realize that it has taken many years to perfect so simple a thing as our common pin. But in the old days pins were very far from being common. In Egyptian tombs we find pins with gold heads. In Greece and Rome clasps and buckles were used. But during the Middle Ages people used lacings of leather, thorns, and slivers of wood, bone, ivory, and shell to fasten their clothes. Pins were such a luxury that it was the custom to give a bride "pin money"; that is money with which to buy pins, a custom from which we get our phrase.

The first pins were made of brass and bent and twisted badly. Furthermore, they were very expensive, as they were all made by hand. Now, thanks to American inventors, the first of whom is said to have been Lemuel Wright, who in 1831 invented a machine for making pins, most pins are made entirely by machinery.

The basis of the common white pin is brass wire, which is clipped to the required length and pointed. It then travels on a machine which flattens the head by jamming the end against a heavy weight. Next the head is shaped and rounded off. The pins are then cleaned in barrels of sawdust and put into kettles containing a mixture of tin and nitric acid, where they are boiled until each is coated with a thin silvery covering. After being polished once more in barrels of sawdust, they are ready to be set in papers and sold.

Common black pins are made from brass, which is boiled in Japan varnish instead of being tinned. For the best grade of black pin, steel is used, the beadlike tops being made by dipping the heads of the pins in a solution of liquid glass.

It is an interesting fact that the United States is the largest pin manufacturer in the world, and that the people of the United States use more pins than any other nation.

How Can a Sound Go Through a Wall?

When a sound wave, traveling through the air, reaches a wall, it communicates itself to the wall and throws it into waves of exactly the same shape and number in each second. The waves in the wall though are slightly smaller than those in the air, for some power is lost in the transfer. The waves after traveling through the wall are communicated to the air on the other side, but there is still another loss of power. If the wall is very thick or composed of

some material that is not a good conductor of the vibration, the sound wave will be much weakened or perhaps entirely overcome.

Why Does a Cat Always Fall On Its Feet?

The cat is by nature a climbing animal, and as such has acquired the instinct of adjusting its motions so as to fall on its feet. It is by its quickness

that it is able to accomplish this truly remarkable feat. A cat cannot fall from a great height, though, without injury, and no animal fears falling more.

How Does a Cat Purr?

Purring is caused by the breathing of the cat when her body is entirely relaxed. Such relaxation occurs only when she is satisfied. Thus cats purr while eating, when going to sleep, or when petted, if they have no fear of being disturbed. But lions and tigers are only big cats, can they purr? The next time you visit a zoo garden, ask the attendant.

How Are Needles Shaped?

It used to be said that before a needle was finished one hundred persons had had a share in fashioning it. Machines have recently done away with much of the handling of needles, but the process is the same.

Needles are made from "blanks" or lengths of fine steel wire. These blanks are cut in pieces just long enough for two needles. Each end of the piece is sharpened by being ground down to a fine, flawless point. The middle of the piece is next flattened, and the spots are indicated where the eyes of the two needles are to be punched. When the holes have been made, a wire is run through the two eyes to hold the needles firmly in place, and the steel is bent until it breaks in halves. The needles are then heated, tempered to the necessary strength and hardness, and polished.

How Are Hooks and Eyes Made?

Hooks and eyes are made from brass wire; this is because brass does not rust as would other material. They are often a by-product of pin making, being made at the same factories from material that will not do for pins. The wire which comes on reels is drawn into a machine by nippers and is there clipped off to the necessary length. One machine makes only the hooks and another the eyes. After the wire is cut to the right length, it is flattened and twisted into the desired shape. The brass hooks or eyes are then put into a kettle, where they are silvered or tinned in a solution of melted metal. If they are to be black, they are japanned with black varnish and then dried. After they are made, they are sewed upon cards and are ready for the shopper.

Where Did Turkeys Come From?

The turkey is a native American bird and one of which we may be proud. Formerly the wild turkey roamed over most of the continent, but there were several varieties. Early comers carried turkeys

back to England, where they became plentiful in the fourteenth century. Then some of these domesticated birds were brought back to this country by later settlers. The common varieties of the present day are the bronze, white Holland, Narragansett, buff, and red. In parts of Europe a black variety is common. More bronze turkeys than any other kind are bred in the United States, and the type is one which cannot well be improved upon.

Who Are the Greatest Sugar Eaters?

The English-speaking peoples. According to a recent census the average amount of sugar used by every person in England in a year was 86.3 pounds; in the United States 81.6 pounds. Denmark had an average of 77.7 pounds; Switzerland, 64.3; Germany, France, and Holland each about 40 pounds. Italy, Greece, and Servia reduced the amount to seven pounds for each person. This record is interesting since sugar is said to be very necessary for our bodily nutrition and, taken in reasonable quantity, to produce energy for work. You should recall these figures when you read of conditions in Europe during the great war, and note how necessary it was for the United States to divide its generous supply of sugar with its Allies.

Why Do Children Crave Sugar?

Sugar is the food best fitted of all for quick use in the body. All of the things we eat are for the purpose of supplying energy to replace that which our daily activities have dissipated. Many foods have but little value as producers of energy, and others are not available for immediate conversion into energy, but sugar is actually turned into real energy within a few minutes after it is eaten. Most children are very active and use up a great amount of energy. They are therefore, always in need of food that can quickly be converted into energy, and as sugar answers this requirement better than any other food, Mother Nature gives children a craving for it.

How Can You Pierce a Coin With a Needle?

To pierce a penny or a nickel with a needle, if the needle is a fine one, would seem to be an impossible task. It is really a very simple matter, and the only apparatus needed is a cork, a needle, and a hammer. If possible, select a needle just about the same length as the cork. Stick the needle through the cork in such a way that the point just protrudes; if the other end of the needle projects above the cork, cut it off with a pair of pincers or heavy shears. After placing the coin and cork on two small blocks of wood, hit the cork a vigorous blow with a hammer. The cork prevents the needle from bending, and the blow of the hammer therefore forces the steel point right through the softer metal.

Why Does a Baseball Curve When the Thrower Gives It a Spinning Motion?

As the surface of a baseball is slightly rough, it carries a thin film or cloak of air with it, which rotates at a high speed. The scientist Bernouilli proved that when the speed of an air current was high, its pressure was low, and when the velocity was low, its pressure was correspondingly high. Because of the speed of the throw, the pressure of the air cloak is low. If the ball had no motion except that of an ordinary toss, this pressure would be equal on all sides. But if the ball is sent by the thrower with a motion that starts it spinning over and over, as it would in rolling down hill, the air passing over the top surface of the ball would tend to check the high speed of the enveloping film while at the same time it tends to hasten the air film surrounding the lower surface. Then, according to Bernouilli, the air around the lower surface will be low in pressure be-

cause of its high velocity; the air above will be at high pressure because of its low velocity, and this slight difference caused by the manner of the throw will make the ball curve downward into the area of lower pressure where there is less resistance. If the rotation of the ball was in the opposite direction, it would curve upward. In the slight variations of throw in the hands of the baseball pitcher comes the difference in air pressure which accounts, by this theory, for the curves.

the escape of the air, and the glass, no longer resting on the marble, but on a thin layer of water, follows the inclination of the slab and slips along its entire length.

What Animal Is Like an Animated Pincushion?

The porcupine's body is almost entirely covered with sharp quills which stand out in all directions. The quills are fitted with numberless little barbs that, once the quill penetrates the skin, keep forcing it deeper and deeper into the flesh. The porcupine lives in a hollow log or cavern among the rocks, and when curved up with his arched back toward the entrance the most dangerous of animals will hesitate about attacking him.

How Can You Make a Tumbler Slide?

Place a glass face down on a marble slab, one edge of which is slightly higher than the other. Before placing the tumbler on the marble surface, soak its rim in water so that the entire rim is quite wet. The glass will remain at rest. But if you place a lighted candle close to the tumbler, and keep it there for a moment or two, you will see the glass begin to move and slide along, as if it were propelled by some mysterious force.

What causes this phenomenon? The heat of the candle expands the air in the tumbler and raises it slightly, but the film of water round the rim prevents

What Little Animals Cling to Their Mother's Neck When She Flies?

Bats never make any nests or even attempt to fix over the crannies where they hide or where the little bats are born. But the little ones are not left at home at the mercy of foraging rats and mice. When the old bat flits off

into the twilight the youngsters often go with her, clinging about her neck, swinging away over the tree tops, while she chases the numberless little flying things of the dark.

Why Do I Float More Easily in Salt Water Than In Fresh?

Because salt water is slightly heavier than fresh water. The body sinks only low enough to displace an amount of water weighing just what the body weighs, and thus will not sink as far in salt water as in fresh. In the Dead Sea or in Great Salt Lake where there is a great amount of salt in the water it is very easy to keep afloat. How did the water in Great Salt Lake become so salty? Why doesn't Lake Michigan get salty? There are immense salt deposits near Salt Lake, do you think the lake was once larger? You will be interested in reading the graphic discussion of Utah.

Who Founded Our American Post-Office System?

Benjamin Franklin was the father of the United States post office. He first acted for the British government, but was dismissed for political reasons. Then, when the Continental Congress established a postal system in 1775, Franklin was unanimously chosen Postmaster General. It was a very primitive system at first, with rates of postage so high as to make letter writing a luxury, but it was the nucleus of what has become a public utility of enormous proportions. Franklin was an excellent organizer and gave the new service a splendid start.

When Were Stamps and Postal Cards First Used?

Stamps did not come into general use until shortly before the Civil War, and it was not until 1872 that postal cards were authorized; since that time the business of the service has increased enormously. Think of twenty billion pieces of mail matter being delivered to residents of the United States in one year, of an annual sale of one hundred million dollars' worth of stamps, postal cards, etc., and of money orders to the amount of five hundred million dollars and over. It is a vast enterprise, which has grown up under the government's paternal eye since Franklin's day.

When Did the Use of Envelopes Become General?

In this country not until after the Civil War. In England Sir Rowland Hill secured in 1840 the establishment of the "penny post," and the government issued at that time stamped, adhesive envelopes. The first envelope machine was patented by Edward Hill, March 17, 1845.

When Was the First Letter Written in America?

In January, 1494, by Dr. Diego Alvarez, who was with Columbus on his second voyage. It was written to the municipal council of Seville, giving the first description of the New World, and left the port of Isabella, San Domingo, February 2, arriving in Seville April 8, 1494.

Who Invented Writing?

No one knows when man first began to record ideas by signs or marks, or whether picture writing, that is, drawing a crude picture of the object of which you wished to convey an idea, or sound writing, that is, making a mark to indicate a certain sound, came one after the other, or both together, or one in one tribe and one in another. Our alphabet comes from the Latin, which in turn had its beginning in the Phoenician, while its name comes from the names of the first two letters in the Greek alphabet, alpha and beta.

Why Don't a Squirrel's Teeth Wear Out?

Our parents and teachers continually warn us that we must not bite hard

things with our teeth, or they will break or wear out. But how is it that the squirrel can gnaw hard wood or nuts all of its life and still have good teeth? When our teeth are fully developed they stop growing, and any part that may be broken off or worn out is not replaced, but in that class of animal called rodents, or gnawing animals, the teeth keep right on growing and no matter how many nuts a squirrel may bite he need have no fear of wearing out his teeth. If one of the incisors be broken off, its opposite continues to grow, in which case at length it locks the jaw and the squirrel starves to death.

What Is "White Coal"?

"White coal" is a name often given to waterpower, because it is taking in a large measure the place of steam power supplied by the burning of coal. In many places the force of falling water drives gigantic water wheels and produces hundreds of thousands of horsepower in energy. Only a very small percentage of the waterpower of the world has as yet been harnessed but as coal becomes more expensive and more difficult to obtain, more and more of the power now going to waste in our rivers and lakes will be utilized. You will be interested in reading about the development of "white coal" in New England and Montana and especially of Niagara. (See Graphic discussion of the States.)

What Causes the Gurgle When I Pour Water From a Bottle?

Well, when you turn a bottle full of water upside down, the water comes out if the cork is out, of course, and as soon as the water starts out the air strives to get in, and every time you hear a gurgle you know the air is getting in. Every gurgle is a battle between the water and the air. Sometimes the air is able to push the water back enough to let it slide into the bottle; sometimes the water pushes the air back, and thus they fight back and forth. The water always gets out and the air always gets in. This action causes the gurgle.

Where Does a Flower Get Its Perfume?

The perfume, or odor, of the flower comes from within the plant itself. The perfume arises from an oil which the plant makes, and just as there are many kinds of flowers, so almost every flower has a different smell. Of course, flowers belonging to the same family or species are likely to develop different smells. The oils produced are what are known as the volatile oils, which means "flying oils," because, if extracted from the flower and placed in a bottle and the cork left out, they will vanish into the air. Without this quality we could not smell them at all.

What Is Meant by Deadening a Floor or a Wall?

By deadening a floor, for instance, we mean inserting between the ceiling of the room below and the floor above, or in the instance of a deadened wall, between the two sides of the wall, some substance like felt, paper, or other nonconductor of sound, which will prevent the sound waves from passing through. This deadens them to the passing of sound or makes them sound-proof.

Where Did the Name Calico Come From?

A fabric of cotton cloth, the name being derived from the city of Calicut, in Madras, where it was first manufactured, and in 1631 brought to England by the East India Company. Calico-printing, an ancient Indian and Chinese art, has become a great industry in this country and in Britain, as well as in Holland. (Read the Storv of Cotton.)

What Makes Some Things In the Same Room Colder Than Others?

The objects in a room which has been kept at a given even temperature of heat will be all the same temperature,

because heat spreads from one thing to another equally. Still, if you put your hands on various objects in such a room some of them will feel colder than others. You touch the tiling of the fireplace and that will feel cool to you. On the other hand, the upholstered furniture will feel quite warm. The piano keys feel cool, while the wood of the piano and case is warm. The difference is due to the fact that heat or cold will run through some objects more quickly than through others. It will run through the tiling on the hearth and the piano keys more quickly than through the upholstering on the furniture or the wood of the piano case. When you touch a thing with your finger you supply some of the heat of your body to the object through your finger. If the object is the tiling on the hearth or the keys of the piano the heat runs through it quickly and you get a cold impression in your finger. On the other hand, if you touch the upholstery on the furniture, through which the heat runs slowly, you get a warm feeling for the very same reason. Thus, anything which carries the heat away from our contact quickly we call a cold feeling object, and if the object touched does not carry the heat away so quickly we call it a warm feeling object.

What Makes a Match Light When We Strike It?

The match lights when we rub it along a rough substance, because the rubbing produces sufficient heat on the end of the match to set fire to the head, as we call it, which is made of chemicals that light more easily than the stick of wood forming the rest of the match. The fire thus started is hot enough and burns long enough to set fire to the wooden part of the match.

To explain this more fully, let me say this. Rub your finger quickly along your coat sleeve or along your trousers, pretending that your finger is a match. You find the end of your finger becomes warm, don't you? Not warm enough to set your finger on fire, of course, but if you had the same combination of chemicals on the end of your finger that there is on the match, you would set the chemicals afire and this would burn your finger, just as it sets fire to the wooden part of the match.

It took a great many years to discover the combination of chemicals of which the head of the match is made. Before that discovery was made it was far from easy to light the light in the evening as it is now. Do you use any safety matches? Can you find out why they will not light unless you rub them on the box?

What Makes the Kettle Whistle?

The kettle whistles only when the water boils and the steam or gas which is the form the water turns into when boiling is trying to escape through the spout of the kettle. You see, when the water starts boiling, the inside of the kettle is at once filled with steam and more is coming out of the water all the time. This steam must get out some way, so it rushes for the spout of the kettle, and because so much of it is trying to get out at a comparatively small opening at once there is quite a pressure and this results in making a whistle out of the spout of the kettle. It is just the same process as when you whistle yourself. To whistle you fill your mouth with air and force it out through your lips, which you have closed excepting for a small opening, by the pressure you can bring to bear, and if you have learned to make your lips into the proper shape and apply the pressure steadily you can sound a very long note and make different notes by making the opening in your lips large or small. The kettle spout has only one size of opening so the sound is practically the same at all time though louder at some times than at others. This is caused by the varying pressure at which the steam in the kettle is being forced out. What great discovery is said to have resulted

because a careful observer watched the steam escaping from a tea kettle? (See 3088.)

What Is the Hottest Spot on Earth?

The hottest region on earth is said to be along the Persian Gulf, where little or no rain falls. On the Bahrein Islands there is no fresh water, yet a comparatively numerous population contrives to live there, thanks to the copious springs which break forth from the bottom of the sea. The fresh water is secured by diving. The diver, sitting in his boat, winds a great goat-skin bag around his left arm, the hand grasping its mouth; then he takes in his right hand a heavy stone, to which is attached a strong line, and thus equipped he plunges in, and quickly reaches the bottom. Instantly opening the bag over the strong jet of fresh water, he springs up the ascending current at the same time closing the bag, and is helped aboard. The stone is then hauled up, and the diver, after taking breath, plunges in again. The source of the copious submarine springs is thought to be in the green hills of Osman, some 500 or 600 miles distant. There are some wonderful springs in the United States. (Read the graphic discussion of Florida and also Missouri.)

Can Animals Foretell the Weather?

Certain instinctive movements of various animals seem to indicate a change of weather. Such is the case with the common garden spider, which, on the approach of rainy or windy weather, will be found to shorten and strengthen the guys of his web, lengthening the same when the storm is over. There is a popular superstition that it is unlucky for an angler to meet a single magpie, but two of the birds together are a good omen. The reason is that the birds foretell the coming of cold or stormy weather, and at such times, instead of searching for food for their young in pairs, one will always remain on the nest. Sea-gulls predict storms by assembling on the land, as they know that the rain will bring earthworms and larvae to the surface. This, however, is merely a search for food, and is due to the same instinct which teaches the swallow to fly high in fine weather, and skim along the ground when foul is coming. They simply follow the flies and gnats, which remain in the warm strata of the air. Wading birds always migrate before rain, likewise to hunt for food. Many birds foretell rain by warning cries and uneasy actions, and swine will carry hay and straw to hiding places, oxen will lick themselves the wrong way of the hair, sheep will bleat and skip about, hogs turned out in the woods will come home grunting and squealing, colts will rub their backs against the ground, crows will gather in crowds, crickets will sing more loudly, flies come into the house, frogs croak and change color to a dingier hue, dogs eat grass, and rooks soar like hawks. It is probable that many of these actions are due to actual uneasiness, similar to that which all who are troubled with corns or rheumatism experience before a storm, and are caused both by the variation in barometric pressure and the changes in the electrical condition of the atmosphere.

What Insect Is a Natural Thermometer?

It is not generally known that the August cricket is a natural thermometer, not exact, of course, but the hotter the evening the more rapidly they play their sharp little instruments, and as the days shorten and the nights become cooler, their waves of sound have greater distance between them until when a frost is threatened, only now and then one more enterprising than the rest keeps up a forlorn sound.

What Animal Has a Living Cradle In Which to Carry Its Young?

When the little opossums are born they only weigh four grains. Think how much that is. For there are seven thousand grains to one pound, which

means that it would take 1750 baby opossums to weigh as much as two cups of sugar. It is quite evident that such tiny creatures could not make their way in the outside world, so the mother opossum has a pouch or false abdomen into which they are immediately transferred, and in this living cradle they remain till able to take care of themselves.

This is not the picture of Mrs. Opossum but of her first cousin, we might say, who lives in Australia. It is Mrs. Kangaroo. You note she has the family characteristic and the little fellows are taking a look at the country as they ride along. The next time you visit a zoo-garden see if you cannot find some kangaroos.

What Animal Will Starve in Twelve Hours?

No animal works so hard for its daily food as the mole. Its whole existence is spent in constantly raising and removing large quantities of earth by sheer force of muscle. Its appetite is voracious; it works like a horse and eats like an elephant. In all its waking moments it is digging and delving and scurrying after worms. Its digestive powers are remarkably rapid, and, with heart and lungs and muscles working at a furious

rate, about twelve hours is the limit it can exist without food.

How Does the Moon Pull the Sea?

Did you ever go to the sea shore for a vacation? And did you build forts and dig caves in the sand on the beach? Then, when you went to play the next morning, you found the beach smooth. Your forts and caves were gone. Grown people told you the tide came up and washed everything away. A tide is the rising and falling of the ocean along the shore. The moon pulls the water up and then lets it go again, so it falls back. See if you can understand it.

You know how the earth pulls the apple down? It pulls everything on or near its surface toward its own center. And everything near enough to be pulled, pulls back as hard as it can. The earth pulls the moon, and the moon pulls the earth. Although it is much smaller than the earth it is just the right size, for its distance away, to keep from falling into or away from the earth. We cannot see its pulling power on the solid parts of the earth. But the ocean is made of water. A slope of land, a brisk wind, many things set water in motion. It feels the pulling power of the moon. Whenever the moon rises over the ocean, it pulls the water that is just under it. So, a great wave, or tide, travels under the moon across the wide sea. When the shore is reached this wave rises higher against the rocks, or spreads over level sand beaches. When the moon sets, the wave goes back to the old level.

We know this is so because the tide always comes up with the rising, and goes out, or ebbs, with the setting moon. If the moon stood still, and always rose and set at the same hours, we could not be so sure that it had so much to do with the tides. But as the moon travels around the earth in twenty-eight days, it rises nearly half an hour later at any given place, every day of its journey. The tides rise just so much later every day, too.

The sun also makes tides. But the sun is so very, very far away, that its pull on our waters is very much less than the moon's. We would hardly notice it if it wasn't for one thing. Sometimes, for a few days in every month, when the sun and the moon are both on the same side of the earth, they pull together. Then the tides rise the highest of all. About two weeks later in the month, the sun is on one side of the earth and the moon is on the opposite side. Then they pull away from each other. The moon wins in this tug of war, but it cannot pull the water nearly so high. Twice in the month the moon's and sun's pulls are at right angles to each other. Then the tides are just of moderate height. If you live near a seashore, make a record of tide soundings or points reached by the tide every day for a month, with the time of the rising of the tide and the moon, and find out for yourself how the moon pulls the sea.

Why Does Rain Fall In Drops?

It's very lucky for us that it does. If rain fell from a cloud in a continuous stream, like a river, anyone caught under it would be drowned. There are two perfectly good reasons why rain cannot do this. The first reason is that a rain cloud is not a tank, and the water in it is not in a liquid state. A cloud is just a great mass of vapor, in which the water is as finely divided as in fog or steam. When the cloud is blown upon by a current of cold air, the vapor runs together, turning to liquid, or the form in which we know it as water. But it cannot form a mass of water in the air, for the air can only hold up a tiny drop of water. When water vapor begins to condense, it forms on something solid as, for instance, a window pane, or the outside of a pitcher of ice water. The only solid things in the air are particles of dust. Using a grain of dust as a center of attraction, vapor condenses on it in just as big drops as the air will hold up. As that amount is

very small, indeed, the vapor in a cloud falls in millions of little round drops, and each drop has a tiny grain of dust in the very center. No wonder the sky looks as if it had had its face washed after a rain!

Why Was the Thistle Chosen As the National Emblem of Scotland?

The story is told that long ago during a Danish invasion of Scotland when a party of Danes attempted to surprise a Scotch encampment during the night one of them stepped upon a thistle and uttered a cry of pain. The sound awakened the Scots and they defeated the invaders and ever since the lowly thistle has borne a high place in their affections.

What Is the Average Length of Human Life?

Statistics prove that at the present time the average length of life is longer than it was a few generations ago. Nowadays it is computed that one-quarter of the people die before the age of six; one-half before sixteen; and only about one person out of every one hundred lives to the age of sixty-five. The average length of life at present it about thirty-three years.

Why Does Burning Wood Crackle?

Wood is a fibrous substance and between the fibers there are little spaces called "cells," filled with moisture, with air, or with other gases. When the stick of wood becomes heated by the flame of the fire, the moisture or the air in the cells becomes heated and expands with explosive force, tearing down the thin partition of fiber on the outside, and thus permitting the gas to escape. A variety of noises is heard; little pops due to the explosion of the gas, and cracklings due to the tearing asunder of the fibers of the wood.

Why Do Plants Need Sunlight?

Most plants, if placed where no light from the sun can reach them, will die very quickly. To prove that a plant needs the sunlight, we have only to place it in a dark corner of the cellar and notice how soon it dies. In fact, if it were not for sunlight there would be no life on earth at all. The plant or tree drinks in sunlight through the surface of the leaves. In fact the ability to take in sunlight constitutes the real life of the tree or plant. Leaves grow thin and flat in order that as much surface as possible may be exposed to the sunlight. If a leaf were curled up like a hoop only a part of the outside surface would be exposed to the sunlight and the amount of life that a leaf could supply to the rest of the tree would be much less. The leaf is so constructed that when the sunlight strikes down upon its green surface, it changes the carbonic acid gas which it drinks in, into its elements, i. e., it takes out the carbon which goes into the body of the plant and combining with other foods and water supplied by the roots causes the plant or tree to grow.

How Long Ago Did Little Girls Play With Dolls?

At least four thousand years ago, for in Egyptian tombs which cannot have been opened for four thousand years we find dolls, carefully carved and painted and nicely dressed, lying next to the mummies of their little mistresses. It is said that the oldest piece of sculpture ever dug out of the earth was a carved dolls.

Why Do Girls Like to Play With Dolls?

Girls like to play with dolls because they come into the world for the purpose of being mothers and the love which they display for their dolls is the mother instinct which begins to show itself early in life. The doll is a make-believe baby to the little girl, but most any little girl will drop her dolls if given an opportunity to play with a real live baby. Once in a while we find a little girl who does not care for dolls but usually

if placed with other little girls who have dolls she will soon become just as devoted a little mother as they.

How Does a Fly Walk On the Ceiling?

If you were to examine a fly's foot with a strong microscope you would find that it was covered with many small hairs and has also some hook-like appendages. These little hooks cling to the smallest irregularity of surface and there is also on the foot a sticky glue-like substance which adheres to any substance able to bear the slight weight of the fly. Mother Nature always provides for the needs of her children.

Is It Good for Us to Laugh?

The old saying "Laugh and grow fat" suggests that laughing is good for us, though perhaps getting fat is not the best proof of it. But it is true that we do derive benefit from laughing. Happiness strengthens the beat of the heart and deepens the breathing, and this extra deep breathing and increased heart action insures that more oxygen passes into the blood, and that the blood is carried more quickly to all parts of the body. If food is eaten with pleasure the digestive juices pour into the stomach and we have better digestion than when we are unhappy and worried.

Why Are Blind People So Quick at Hearing?

An ordinary person who has all of his senses receives a great many impressions from each of them. Now if one of the senses should be destroyed, the brain would need to rely more on the others. A blind person is unable to get the information which ordinarily comes to us through our eyes and must depend more on his ears and his sense of touch, and you will soon find that the reason they hear better is that they listen more attentively. There is a lesson for you in this answer. Every sense you have gains in strength as you exercise it. So if you wish to improve yourself in any way, simply exercise yourself in that particular way. You can see but probably you go on through life and fail to see many things you should.

Why Cannot Babies Walk?

A human baby has a great many things to learn before it can safely go about alone. Time is required for its brain to develop and if it could walk sooner it might get into all sorts of trouble. As we go upward in the scale of life we find that each class can do more than the class beneath it, and that the task of the parents in preparing their offspring for the battle of life is greater and the period during which the young is learning is longer. When we reach the human family we find that the parents have the greatest responsibility, that the young are the most helpless, and that they require the longest time in which to become self-sustaining.

Why Does My Heart Beat Faster When I Am Running?

When you run more blood is needed in your legs and other parts of your body. The operator in charge of the exchange sends orders to the heart to beat faster, and the heart obeys. If you stop running the heart will keep on beating fast until the necessity ceases.

Why Does the Heart Not Stop Beating When We Are Asleep?

It is necessary that the heart beat continually and it is just as necessary that the brain have some rest. If some arrangement had not been made so that the heart could beat while the brain rested we could not live. So under ordinary conditions the heart beats are controlled by certain nerve cells which are located in the heart itself. Under certain conditions, though, beats of the heart are controlled directly by the brain. We may look at it this way: The heart is a machine largely automatic in its work, but then the most perfect auto-

matic machine in the world requires an operator to watch it. So the intelligence in charge of the cerebro-spinal exchange in the body has his eye, so to speak, on the heart, and even when the body is asleep there is always a night force as you might say left in charge.

Why Do My Hands Turn Blue When Cold?

The heart forces through the arteries the pure blood, which is red in color, and after this passes through the capillaries it is returned to the heart through the veins. The veins carry only used-up blood, and this is of a purplish blue color. When your hands get cold it is because there is not sufficient circulation of warm red blood through the arteries to keep them warm or to give them a pinkish color. The veins though are filled with blue blood and as there are many veins close to the surface the hands look blue when they are cold.

Why Does My Face Get Red When I Run?

When you run or exercise violently more blood is required in all parts of the body, so the intelligence in charge instructs the heart to beat faster and to force more blood through the arteries. That the heart obeys, you can tell by feeling it after running and noting how much faster it beats. The blood that the heart forces through the arteries is bright red in color and as the walls of the arteries are thin the color shows through and gives the skin a red or pinkish color.

How Do Birds Find Their Way?

One of the most interesting things in nature is the migration of the birds. In the fall some go south to a warmer climate and in the spring they come north again. Some birds even come back to the same tree and the same nest. For want of a better explanation we call it the "instinct of migration," but this is really more a statement of fact than a true explanation of their ability. To tell the truth, we do not know just what impels the bird to make these long flights or how they are able to find their way back over hundreds, sometimes thousands of miles of unknown country. Turn back to our spring rambles and read about bird marriages.

Why Do Birds Sing?

Birds sing when they are making love. The male bird is the singer and sings to his mate to attract her, to charm her, and to further his wooing. This lasts even after the eggs are laid, and while they are being hatched. But, just as soon as the little birds are hatched the singing ceases, and the father bird devotes himself assiduously to the task of providing meals. He seems to realize that the time of play is over and that the duties of fatherhood are serious ones. But if the nest should be destroyed or the little ones removed, he will start his singing and wooing over again, as if to inspire his mate to help him build another nest. Then again birds sing because they are "built" that way. They sing to express pleasure. The canary in your room certainly sings because he enjoys it.

Why Does My Heart Beat Faster When I Am Scared?

Because the intelligence in charge of the central telephone exchange of the body is suddenly informed that danger threatens and instantly orders every muscle of the body to be ready for action and the heart responds by sending increased blood supplies to all parts of the body.

Why Does My Hair Stand On End When I Am Frightened?

At the root of each hair there is a little muscle which has the power of making that hair stand straight up. We know that when one is badly frightened that little muscle makes the hair stand straight up, "on end" as we say. In explanation we must refer to "inherited

habits" that we have talked about. What makes your cat's hair raise when she sees a dog, or the dog's bristles stand out, or the old hen's feathers raise when you try to bother her little chicks? Well, we have some way inherited some of these habits. When danger threatens our hair bristles up.

How Do I Swallow?

When food passes into your throat the muscles act in the form of a succession of rings. The ring at the top of the throat first contracts and pushes the food down a little way, and then the next ring contracts and pushes it down a little farther until it finally reaches the stomach. It is just like pushing a ball into a stocking which is not quite large enough to receive it. You put the ball in the top of the stocking and then by making a ring of your fingers you keep pushing it all the way down.

What Makes a Lump Come in My Throat When I Cry?

You have just learned that the muscles of your throat are arranged like rings. These muscles can make these waves or force things upward as well as downward but of course only do this in exceptional cases when you have swallowed something you should not. When you cry or lose control of yourself these muscles act in a way opposite to their regular action, and when the wave reaches the top, we feel the lump in our throat.

What Are the Sparks That Sometimes Fall From the Trolley?

When the motorman of an electric car turns on the power, an electric current flows out from the power house along the trolley wire, down through the motors of the car, and back to the power house again through the rails and the ground. So long as this complete circuit is maintained, the current continues to flow evenly and can be stopped only by introducing into the circuit some such nonconductor of electricity as air.

As the trolley car speeds along the street, the trolley wheel frequently strikes against the "ears" or supports of the overhead wire and rebounds a short distance. A small air space is thus left between the trolley wire and the wheel. The strength of the current which has been passing from the wire down to the motors of the car is so great that it cannot change its course immediately. As it flows through the air for an instant a high degree of heat is produced by the resistance of the air. So intense is this heat that small portions of the metal parts between which this "arc" or contact occurs are melted and thrown out in the form of sparks. These sparks are really red-hot bits of the wire or the trolley wheel.

Why Do I Open My Mouth When Listening?

In your physiology you have learned that there are little tubes which run from the mouth to the ear. These are called the Eustachian tubes and their purpose is to make the density of the air inside the ear the same as that outside. It is possible that when we open our mouths we hear better because of this connection between our mouth and our ears. You might test this for yourself by placing a small watch in your mouth and finding out whether you can hear the ticking better or not.

Another reason for opening our mouths when listening attentively, and perhaps a more plausible one, is that this habit, like many others, comes to us from long ago before we had weapons of any kind and must depend on our hands and teeth for defense. Thus you can imagine that if one of our prehistoric forefathers was walking in the woods and heard a queer sound, he would stop and listen closely, and while doing so would place himself in a position of defense by getting his hands and his teeth, his only weapons, ready for use.

How High Up Does the Air Extend?

Just how thick the layer of air which surrounds the earth is we do not exactly know. Near the earth's surface the air is quite dense, but as we go higher and higher it becomes thinner or more rarefied as we say. Thus at the tops of some of the highest mountains it is hardly sufficient to breathe and in some of the recent flights in air ships when very high altitudes were reached the aviators carried cans of oxygen with them.

It is probable that the air extends upward some fifty or a hundred miles for we know that shooting stars, or meteors, are not visible until they strike the earth's atmosphere and we see them when they are many miles away.

What Makes a Soap Bubble?

A bubble is a hollow ball of water with air inside. As the air comes through the water it gets caught in such a way as to make a bubble and as the air in the bubble is lighter than the water it comes up into the air. The sides of a bubble are very thin and as the water keeps running down they finally get so thin that they burst. When we put soap into the water it makes the sides of the bubbles tougher and we can make them larger and they last longer. The many colors which we sometimes see in a bubble are reflected rays of light just as those seen in a rainbow. Bubbles are round because the pressure of the air inside is equal in all directions.

How Large Is the Sun?

It is very difficult to give a clear idea of just how large the sun really is. Scientists tell us that it is 865,000 miles in diameter, and that it is 2,722,000 miles around it. Such figures do not mean much, however, to us, as we cannot conceive of anything that large. A train which goes sixty miles in an hour is supposed to be going pretty fast. Now, if there were a tunnel right through the center of the sun and we could imagine a train running through it at a speed of a mile a minute, it would take it six hundred days to go through, or over five years to go around the sun.

How Far Away Is the Sun?

It is almost as difficult to give an idea of the distance to the sun as it is to explain its size. When you are told that it is five blocks or five miles to some place you can easily understand what is meant, for you have often gone that distance, but when you are told that it is over ninety million miles to the sun, you really do not know much more about its actual distance than you did before. Perhaps the following illustration will help. About the fastest that man has ever travelled has been in some of the newer aeroplanes and these make a speed of about one hundred fifty miles per hour. Now, imagine a baby starting in one of the best machines and flying continuously with no rest or no stops. When you learn that he would be seventy years old by the time he reached the sun, you can perhaps form a better understanding of its great distance from us.

Why Is Your Right Hand Stronger Than Your Left?

This is true only if you are right-handed. If you are left-handed your left hand will be the stronger. If you are ambidextrous, your hands will be equally strong. We get our strength by exercising, that is, using the different parts of our body. If you are right-handed you naturally use your right hand more, and it becomes not only stronger but more capable than your left hand. However, if you should break your right arm and be compelled to keep it in a bandage for a considerable length of time, you would find that you would use your left hand more and it would become stronger.

Why Does a Barber's Pole Have Stripes?

In early days a great many of our ailments were attributed to too much blood

in the body, so when anything went wrong with a man or a woman the first thing proposed was to reduce the amount of blood by bleeding the patient. In those times the barber not only cut hair and shaved people, but he was also the surgeon and bled people. The barber's pole was his business sign. The gilded ball at the top represented the brass bowl in which he prepared the lather, the pole itself represented the staff which people held during the operation, and the red and white stripes stood for the bandages, the white one being used before the operation and the red one after.

What Is the Origin of "Honeymoon"?

Among some of the early German tribes there was a practice among the newly married couples of drinking a kind of wine made of honey for a month after marriage. Thus we get the first part of the word honeymoon from the beverage and the latter part from the time it was used as you know our month is equivalent to one moon.

Nowadays the custom of drinking wine made from honey has been dispensed with and the word honeymoon is used to designate the trip whether short or long, that a newly married couple often take away from home.

Are Birds' Nests Ever Used for Food?

The Chinese use a certain kind of birds' nest as food. These nests are shaped like a swallow's nest, are about the size of a half teacup, are found in caves on the sea cliffs, and have the appearance of fibrous gelatine. The finest nests bring about $12.00 a pound. The caves wherein the eggs are found can only be reached by going down hundreds of feet on a rope ladder over the face of perpendicular cliffs overhanging the sea.

What Causes the Colors of Sunset?

At sunset the rays of light from the sun that you see strike the earth at an angle and must pass through a greater distance of air before they reach you. The little foreign particles in the atmosphere break up the white rays just as does a prism, and thus we get all of the different beautiful shades of color. For this reason the sunsets are often more beautiful when there are many impurities and much dust in the air. And for just the same reason that you have red in the morning, the principal color at evening is red.

Why Is the Sky Blue?

Sunlight is a white light and you have probably already learned that a ray of white light is made up of rays of light of different colors. These colors are red, orange, yellow, green, blue, indigo and violet. If you separate a ray of sunlight you will always get these colors in this order. Some things absorb certain of these rays and throw off others, and in doing this make all of the various shades of color. The air or sky is filled with countless tiny specks of dust and these catch or absorb part of the rays of sunlight and throw off others, and it is the ones that are absorbed that make the sky blue. Sometimes the sky is a light blue and sometimes a darker blue and this variation is due to the different kind and condition of the tiny specks of dust and the different angle at which the sunlight strikes them.

What Little Animal Often Rides on His Nurse's Back?

There is one baby animal that rides when he goes bye-bye. He isn't carried on his mother's back, or in her breast pocket. He rides in a hammock on the back of a trained nurse. Something dreadful would happen to that nurse if he should stumble and drop the baby. Its mother follows close behind them all day, watching with her big brown eyes. The owner of the animals watches, too. That is a precious baby. If he lives to grow up he will be worth as much as a fine horse.

It is the baby camel that rides in this way. Although he is three feet high, and heavier than a bossy calf when he

is born, he is so weak and wobbly on his legs that he can scarcely walk. Without his mother's milk he would die. The mother has to go with the caravan of hundreds of other camels. A caravan, or passenger and freight train of camels, travels fifty or more miles a day across the burning sand and rocky hills of the deserts of Sahara and Arabia. So the helpless baby camel is put into a hammock, and swung from one side of a big, two-humped freight camel. The nurse may carry half a ton of other things besides—leather bags of water, bales of cloth and dates, jugs of oil and blocks of rock salt. All day long the nurse swings along at a rocking gait. The baby must feel much as a human baby feels when rocked in a cradle.

There is a curious reason why the baby isn't put on his mother's back. Camels are very stupid animals. If the mother could not see her baby, even if it was on her own back, she would be apt to think he had been left behind. Then she might turn and bolt for the last camping place. On the nurse-camel she can see him, and she follows contentedly.

Here are some other baby animals taking a ride, this time on their mother's back. You will note that they are all making good use of their tails. These are baby 'possums. You know when they were very young their mother carried them in a specially prepared pouch. Do you know of any other animal that uses the tail to support itself? Well, the next time you go to a zoo-garden take a look at the monkeys.

Why Do Some Plants Have Thorns?

Flowers and plants have enemies that would destroy them and as they cannot run away as animals do they must have some way of protecting themselves. They do this in various ways, but one of the most common is thorns that prevent ani-

mals from eating them or trampling upon them. On some plants, like roses, the thorns were originally for the purpose of enabling them to climb and though they may grow now where the thorns are not needed, they still retain them. You will be interested in reading about the cactus on another page.

What Are "Shooting Stars"?

Shooting stars are really not stars. They are pieces of rock or iron which come from some place in the universe and strike the atmosphere that surrounds the earth. You know that friction or rubbing causes heat and as these rocks are traveling at a prodigious rate of speed when they strike the air the friction makes them so hot that they burn up, and that is what we see. These rocks are called meteors. Most of them are entirely burned up long before they reach the earth's surface, but a few are so large that they are not entirely consumed and reach the earth. In most any museum you will find meteors. Thousands and thousands of them are drawn toward the earth and if it was not for the protection afforded us by the air everything on the earth would probably be destroyed.

Why Does Rain Make the Air Fresh?

There is considerable dust and other impurities in the air. As the rain falls, it catches these impurities and brings them to the earth thus leaving the air washed absolutely clean. During a rain there are usually considerable electrical changes in the atmosphere and these electrical changes produce a gas called ozone which has a delightfully fresh smell.

How Do Birds Learn to Fly?

In most instances birds are entirely helpless when hatched and must be cared for by the father and mother bird until strong enough to look out for themselves. Birds are probably not taught much in the sense in which we ordinarily mean it, as when we say a boy is taught his arithmetic lesson. Practically all of a bird's knowledge comes to it by instinct. Sometimes though, we see an old bird fluttering about in the trees near a young bird as if to instruct it and to encourage it to make an attempt at flying. Valuable knowledge of use of flying machines was gained by watching young storks practicing with their wings.

Why Does It Take Thirteen to Make a "Baker's Dozen"?

In days of long ago there were very swift and severe punishments meted out to any baker who was convicted of giving short weight or measure. To avoid any chance of falling below the standard the bakers adopted the custom of allowing an extra loaf with every dozen.

How Many Stars Are There?

It is impossible to tell how many stars there are. Probably we will never know. A great many can be seen with the naked eye on a clear night. With a powerful telescope millions more can be found, and when to the telescope is added a photographic plate this number is largely increased, for a photographic plate is more sensitive than our eyes. By photographing different parts of the heavens and then counting the stars in each photograph astronomers have already found over a hundred million, but probably when we have larger and more powerful telescopes this number will be greatly increased. Can you tell what infinite means? Some scholars think the number of stars is infinite.

What Insect Carries Its Babies In a Valise?

Attached to the body of the cockroach is an egg case which looks considerably like an old-fashioned valise. This is divided into two compartments and there are about thirty eggs in each. When the mother cockroach feels the little ones stirring she rips up the valise, lets out the babies, and then with true economy, eats up the case.

How Long Would It Take to Count a Billion?

If you were to count at the rate of one a second, which is pretty fast counting when the large numbers are reached, by working twelve hours you could count 43,200 in a day. Now if you were to leave out Sundays, and take a two weeks' vacation, which you would probably need, you could count almost thirteen million in a year. So you see if you were to begin when you could just begin to talk, you would be about seventy or eighty years old by the time you had counted a billion. You should remember this when you read about the billions the world spends for war.

Are Peanuts Really Nuts?

Peanuts are not really nuts, they are vegetables. They grow underground, but have a pretty little plant with a yellow blossom. As the blossom passes, a little stem is produced which buries itself in the earth, and on the end of this stem the peanut pod is formed.

How Fast Does a Wireless Telegram Go?

The speed at which a wireless message travels is supposed to be about 186,000 miles a second. Thus if you were in New York and sent a message to London it would take about one-sixtieth of a second for it to cross the Atlantic, a period of time too small for the human mind to grasp. In other words a wireless will cover a distance in a fraction of a second that it takes the fastest ship almost a week to cross. What is it that travels? Sounds? Vibrations? In what do they travel? Air? Ether?

What Good Can Come From a Toothache?

Anyone who has had a severe toothache will scarcely agree that there can be any use attached to such dreadful pain. But even a toothache has its purpose, and its use, and is often a blessing in disguise. Scientists tell us nowadays that many of our ills come from the bad condition of our teeth. A hollow tooth is a convenient lodging place for microbes or germs that may cause severe illness. Oftentimes we might not know that our teeth were in bad condition if they did not pain us, or we might be tempted to neglect them, but when a hollow tooth goes to aching, as only a hollow tooth can, most of us make a bee-line for the dentist and get it fixed up just as quickly as possible, and in this way the deadly microbes are routed and we may be saved from a serious illness.

How Was the First Lead Pencil Made?

It was long known that a piece of graphite would make a mark if rubbed on a piece of paper, but it remained for a school girl in Danvers, Massachusetts, to make the first lead pencil. It is said that she took a piece of graphite, crushed it with a hammer, mixed it with gum, and stuffed the mixture in an alder twig from which the pith had been removed. This experiment was successful and since then many improvements have been devised until now the manufacture of lead pencils is a highly specialized business. Is graphite lead? Here is a strange fact to think over; that girl—being such a smart one—probably got rich and wore diamonds in after life. Do you know that graphite and diamonds are only different forms of the same thing?

What is Graphite?

Graphite is a form of carbon. Did you never smoke a piece of glass to look at the sun? The black substance that gathers on it is pure carbon. You know that coal is largely carbon, and that the varieties of coal—bituminous or anthracite—were caused by a difference of the pressure to which the coal was subjected when it was forming. So that we have soft coal west of the Alleghanies and further north and east we have graphite.

Where the pressure has been very great (say deep in the earth) we have diamonds.

Why We Count In Tens.

When man first found it necessary to count the nearest objects were always his fingers and toes, and as he had ten fingers and ten toes it was natural for him to count in tens, and he has been doing so ever since. Today, because our toes are usually encased in shoes and hard to reach we use only our fingers to aid us in counting, but the first men could reach their toes just as easily as they could their fingers, and so they used both and in that way could count to twenty.

How Do We Get Our "Names"?

Just as soon as men learned to communicate by sound they must have had some way to distinguish one from another so that they could be spoken of or to. The study of names is very interesting and we find that in the earliest times groups of people that were closely related were apt to take the name of some animal or object from which they claimed to be descended. The animal or object was called a "totem." Thus communities would call themselves wolves, or bears, or suns or moons and would wear rude pictures of their totems to identify themselves.

Of course, if there were many in the community all could not be called simply by the one name and the practice developed of adding another distinguishing name, thus one member of the Wolf family might be called "Hungry Wolf" and another "Big Wolf."

In more recent times we find that people were named after some personal description or peculiarity and we get such names as Small, White, Long, Brown, Green, etc. Or a man might be named from his occupation such as Smith, Hunter, Farmer, etc. Many other names were invented in various ways. For example, if there were so many Wills or Johns in a community that they could not be distinguished, one of the younger ones might add the word son to his father's name and thus we get Wilson or Johnson.

What Makes the Stars Twinkle?

The stars really do not twinkle, but just appear to do so. You probably know that many if not all of the stars are great suns which are constantly throwing off heat and light just as our sun does only they are so far away that but little of either ever reaches us. When the light from a star strikes the air which is around the earth, it encounters may objects—little particles of dust and water which are always floating around in the air. These interfere with the rays of light. If you were to look at a lighted window some distance away while many people were passing, the light in the window would appear to twinkle.

Why Does a Pencil Write?

A pencil writes or makes marks when the surface on which you are scratching it is rough enough and hard enough to wear off a part of the pencil. You cannot write with a pencil on a pane of glass because it is so smooth that the pencil will glide over its surface, nor can you write on anything very soft, because it will not wear off enough of the pencil to make a mark. You can prove to yourself that a pencil constantly wears off by recalling that as you write it keeps getting shorter and shorter.

When Was Asbestos First Used?

The early Greeks seem to have used it woven into cloth for aprons and in connection with some of their religious ceremonies because it could be made absolutely clean by the great purifier, fire. Asbestos is a curious paradox because it has the characteristics of both vegetable and mineral matter. It is fibrous like the flax and hemp that grow in the fields; yet it is the one indestructible element on which neither fire, water, acids, nor time have any effect. It is found in the earth in layers between

beds of stone. There is no certain means of locating it except by exploring without any definite traces as a guide. It exists all over the world, but the best quality comes from Canada. This is so strong and white that it can be made into stout cloth without the addition of any other substance.

Where Do We Get Our Time?

Three and three quarter minutes before noon on every week day the beats of the Naval Observatory clock at Georgetown Heights, in the city of Washington, begin to sound over a special wire of the Western Union Telegraph Company, which is connected with 900,000 miles of telegraph lines stretching all over this country. Once a second a signal is ticked off, until ten seconds before noon. Then there is an interval of silence, and at twelve precisely a final click tells hundreds of thousands of persons that it is noon by the official Observatory clock in Washington. This clock is set and regulated by star time. The Observatory possesses a telescope so mounted that it points always in the meridian. Every night several observers watch through this telescope for the passage of certain stars across the field of view. Precisely when these stars cross a hair line in this field each observer presses a key that records the time of transit. Knowing exactly when these stars are due to pass over the meridian line of Washington, the astronomers take the average of these many nightly observations and from it regulate the master clock, so that it is always ready to send the correct signal each noon.

Why Do I Get Out of Breath When Running?

The purpose of breathing air into the lungs is to purify the blood. We have just learned that more blood is required when running, and that means that there is more blood to be purified. The heart beats faster, and pumps more blood into the pulmonary artery, and that in turn conveys it to the lungs to be purified. Unless you are in good training it is almost impossible for you to supply the lungs with enough air for this purpose, and they keep calling for more air.

How Does the Ivy Climb a Wall?

If you will examine a creeping ivy vine carefully you will find that it sends out many little shoots or tendrils which attach themselves to rough places in the wall. Of course, if there was only one or just a few of these shoots they could not support the vine but there are a great many of them and each holds a little, and by pulling all together they are enabled to support the heavy vine.

Why Do We Use Copper for Telegraph Wires?

Copper is an extremely good conductor of electricity, and that is the reason we use it for the telegraph wires. By the term "good conductor" we mean that it carries the current of electricity quickly and without loss. Thus you say a good road is one where a horse or automobile may travel quickly and without great effort. Gold and silver are good conductors also and if it was not for the great expense they could be used for telegraph wires. Glass, on the other hand, is a very poor conductor, and to prevent the electricity from running off the wires and down the poles into the earth, glass insulators are used where the wires are fastened to the poles.

Why Do We Use Tin Cans?

Tin cans are really not made of tin. They are made of iron and merely covered with tin. Iron is very strong and as we have already explained very abundant and cheap, but it has one disadvantage—it rusts or tarnishes easily. Tin, on the other hand, while not as abundant as iron, and not as cheap, has a luster that will not tarnish, so we make cans and such articles out of iron to obtain strength and to insure cheapness

and then we cover the iron with a thin layer of tin so that rust or tarnish cannot destroy them or harm their contents.

Why Does an Onion Make the Tears Come?

The purpose of tears is to wash the eye. Every time you wink a little tear is released from under the eyelid and the wink spreads it all over the eyeball, washing it perfectly clean. Then the tear runs along a little channel at the lower part of the eye and out through a little hole into the nose, thus keeping the nose moist so that we can breathe and smell better. When an onion is cut it throws off tiny particles and these striking the eye irritate it and nature, to protect the delicate organism of the eyes, sends more tears to wash it and protect it. Sometimes so many tears come that the little channel and orifice into the nose cannot carry them all away and they overflow onto the cheeks.

What Is the Hottest Known Flame?

That of oxyhydrogen blowpipe, which is hydrogen burning in oxygen. Other hot flames are those of alcohol, of gas mixed with air in the Bunsen burner, or of gasoline or kerosene vapor mixed with air in the plumber's flare or the blueflame stove. The flame of an ordinary gas or kerosene burner is cool, comparatively speaking. None of these flames, however, affords so intense a heat as the electric arc, the most powerful heat agent man has at command.

Why Do Coats Have Buttons On the Sleeves?

There was a time once when handkerchiefs were not in universal use and when people had bad colds they used their sleeves as we would now use our handkerchiefs. An old king once had an idea of dressing some of his soldiers up in a very fancy uniform, but soon noticed that they were using their sleeves for handkerchiefs. He immediately decreed that rows of buttons should be sewed on the sleeves so that whenever a soldier attempted to use his sleeve as a handkerchief the buttons would scratch his nose. These buttons were ornamental and it soon became a fad to sew them on every coat. After a while when handkerchiefs were commonly used some one placed the buttons on the back of the sleeve and left off all but two or three, and that is the way the tailors have been sewing them ever since.

What Makes the Sounds In a Sea Shell?

These sounds are really not the sound of the sea waves as many believe. Because of its peculiar shape a sea shell is almost a perfect "resonator" or sound magnifier, and gathers together and enlarges many sounds which we might otherwise be unable to hear. If you were to take a sea shell to some place where it was absolutely quiet, you could hear no sound.

How Much Wool Is There In a Suit of Clothes?

Most people believe that it is the cost of the wool in a suit which makes it so expensive. This is hardly true. It has been estimated that to make a man's medium weight, pure wool suit, it takes about nine pounds of wool. If you will look in your daily newspaper and see what wool is worth today you will see that it is only a small part of what you are compelled to pay for a suit of clothes.

Why Doesn't An Iron Ship Sink?

You know that iron will sink and it is logical to think that a ship made of iron would sink also. True it would if it were made a solid piece of iron, but an iron ship is hollow and contains much air, and the air is so much lighter than the water that it holds the iron ship above the water. In making an iron ship care must be used to insure that there is more than enough air space inside the ship to offset the weight of the iron. Do you think a stone ship could

be made to float? They are now making ships of concrete.

Why Does the Handle of a Poker Get Hot?

The reason that both ends of the poker get hot is that iron is a good conductor of heat. By the term "good conductor" we mean that iron carries heat easily. The particles of iron are very close together and when the particles near the fire get hot, they hand the heat over to the next particle, and these in turn to the next, until the handle end gets warm. What is it the particles of iron pass on?

Why Does Not a Stick Get Hot?

A wooden stick does not get hot as an iron poker does because wood is a poor conductor of heat. No difference how hot the particles of wood that are near the fire might become, they could not pass this heat on to the next particle of wood as did the particles of iron in the poker. For this reason the handles of pokers, shovels, pots, etc., are often made of wood so as to protect our hands.

What Is the Milky Way?

On looking at the sky on a clear night in summer you can see a luminous circle extending completely across the heavens from north to south. This is popularly called the "Milky Way" because it has some resemblance to a stream of milk. It is produced by myriads of stars not hundreds, or even thousands, but actually millions of stars. They are so far away and there are so many of them that we cannot distinguish each separate star, but with a strong telescope many of them can be seen. When you consider that each one of these stars is a sun like our sun, some smaller, but many larger, you begin to realize the immensity of the Universe.

Why Do Not the Stars Shine In the Daytime?

The stars shine in the daytime just the same as they do at night, but during the day the light from the sun is so bright and strong that the light from the stars is lost. If you are fortunate enough sometime to witness a total eclipse of the sun you will be able to see the stars in the daytime, or if you will go down into a deep well or a mine where you can only see a small patch of the sky you will be able to see the stars during the day.

Which Metal Is the Most Valuable?

By most valuable we mean which is the most useful to mankind. Of course there may be differences of opinion in regard to this, but after you consider the many, many ways in which iron is used you will probably agree that we could get along better without any other metal than we could without iron. The fact that iron is found in so many places and that there is such a great quantity of it adds greatly to its usefulness, for no matter how useful an article may be if there is only a small quantity of it, it cannot be very valuable to mankind.

Why Is Gold So Precious?

Gold has long been considered one of the most precious metals because of its beautiful color, its luster, and because it does not rust or tarnish when exposed to the air. It is the most malleable metal, by which we mean that it can be hammered into very thin sheets, so thin that it would take 200,000 of them to make an inch. It is the most ductile metal, meaning that it can be drawn into the thinnest wire. It is very difficult to dissolve gold, no acid will touch it and only by combining nitric and sulphuric acid can it be dissolved.

How Does a Pen Write?

Writing with a pen is quite different from writing with a pencil, because we do not wear off the end of the pen but let the ink flow from it. For this reason we must have a surface that will draw the ink from the pen and absorb it. For good writing we must have a surface that will absorb enough ink and yet not

too much. A piece of glass will not absorb any ink and a piece of blotting paper will absorb too much, so neither makes a good writing surface.

How Does a Blotter Take Up Ink?

A blotter is so made out of very loose light paper that it has excellent ability to absorb. The thinner the liquid the more easily the blotter will absorb or take it up. Ink is nearly all water and consequently very thin and the blotter is of very loose texture and very porous so it absorbs the ink just as a sponge would do. Can you tell us why if you put a corner of a blotter into a blot of ink that the ink will run up into the blotter?

Where Does Chalk Come From?

Ages and ages ago there lived in the sea trillions and trillions of very tiny creatures. These died and fell to the bottom of the ocean, and then all of their bodies were destroyed except that part made out of carbonate of lime. This was left and kept piling up, each particle pressing against the other and the immense weight of the water above pressing over all until it became a solid mass. There formed layers of chalk. Later on these layers by great changes in the earth's surface were raised until they stood above the water and were accessible to man. Do you suppose the same process is going on now in deep seas?

How Far Can a Fly Fly?

Marked flies have been known to go as far as a thousand yards, when there was no food in sight nearer. Seven or eight hundred feet seems to be their common record, but again and again they have been proved to have traveled three to four hundred yards.

Who Was the Originator of the Lifeboat in America?

Joseph Francis (1801-1893). He was born in Boston and died in Washington. Congress voted him a medal of pure gold in 1890. His original life-car, which saved two hundred and one lives from the wreck of the Ayrshire on the New Jersey coast in 1850, is on exhibition in the National Museum. People laughed when it was made, as they did at his idea that a corrugated iron boat could be made that would float, since everybody knew iron would sink in water.

What Is the Horse Power of a Lightning Flash?

A mathematician has reckoned that the amount of light given by a single lightning flash is sufficient to light an area two miles square with an average illumination of one candle. To produce such an illumination over so large a territory for one second would require the expenditure of thirteen thousand horse power.

What Is a Horse Power?

The term, horse power, is supposed to mean the power that an average horse can exert. When the steam engine was first invented it was but natural that men should try and state its ability to do work in terms of horses, say for instance it could do as much work as fifty horses. But that is utterly meaningless since one horse may be twice as strong as another. So a precise term was used. It means a force sufficient to move 33,000 pounds one foot in one minute. It has no reference now to a horse.

Where Did We Get the Word "Thimble"?

About two hundred years ago the first thimble made its appearance in England. A metal worker by the name of John Loffing made a curiously crude affair that was used for sewing. It was in the shape of a bell and was worn on the thumb. It was literally a "thumb-bell." Later on it was found that it was more effective if worn on the finger, but the name clung and in its shortened form applies to our modern thimbles.

Why Do I Feel Sleepy After Eating a Hearty Meal?

As soon as food is taken into the stomach, all the blood that is not needed elsewhere rushes to help digest the food. It is drawn from the brain, which relaxes. The brain never makes us feel sleepy when it is full of blood. For this reason it is best not to over-exert the mind or the body immediately after eating, but to allow the stomach some time to properly digest the food.

What Is the Origin of the Custom of Lifting the Hat?

In the days of chivalry a knight always wore full armor in public. It became a custom for a knight when entering a company of friends, to remove his helmet, signifying that he was safe while in their presence. Later on when the hat displaced the helmet, the custom remained and that is why we lift the hat today.

What Insect Rides In a Balloon That He Makes Himself?

Spiders, especially the smaller ones, as all other animate things have the wanderlust, and construct remarkable vehicles to carry them on their voyages. When a spider's ambition turns to ballooning, it hies away to a fence post, a twig or it may be the top of a golden rod. Our spider takes a firm hold with its legs and commences spinning silken threads. If atmospheric conditions are right these fine threads will float upward and when the pull is sufficiently strong the spider grasps them firmly with its feet and goes sailing upward and away on the breeze.

What Insects Keep Slaves?

Very frequently ants have slaves to work for them. Large colonies of warrior ants sometimes make raids upon neighboring cities of other species, defeat them in pitched battles and carry home their young to be raised as slaves. Ant wars are no pink tea affairs but are bloody conflicts. Many a head is nipped off, and may a soldier ant limps homeward after the fray minus one or more of his six legs.

Why and How Does a Firefly Glow?

In our yards we often see the firefly, or lightning bug, and probably most everyone has wondered how and why it produces its light. The firefly is a kind of beetle. Only the female has a light, and she shows this in order to attract the male. The light giving organ consists of fatty tissue supplied with numerous air tubes and nerves; the nerves stimulate the air tubes and the latter convey oxygen to the fatty tissue but the process by which the light is produced is but little understood.

Why Do We Use Our Right Hand When Shaking Hands?

In the olden times all men went fully armed and were ready to fight at any times. Guns were not in use then, and the sword was the common weapon. Then, as now, most people were right handed, so the sword was carried in the right hand. When two men met it was very necessary that each know whether or not the other was peacefully inclined. If one on approaching would extend his right hand so that the other could see that it contained no weapon, then if he too wished peace he could extend his right hand weaponless to show that he accepted the truce. By clasping hands neither could change his mind and assume a fighting attitude without fair warning.

Why Do We Clink Our Glasses Before Drinking to Each Other's Health?

When the Roman gladiators fought a duel with swords it was the custom to give each of the contestants a glass of wine just before the fighting began. The wine was usually furnished by the friends of one of the gladiators. Before drinking to insure against treachery, the gladiators poured the wine back and

forth from one glass to the other. Thus if there should be poison in one glass, both would be poisoned.

Why We Have to Develop Photographs In a Red Light.

We know that a ray of white light is a twisted cord, so to speak, of all sorts of thread colors—red, yellow, green, blue, and so on. Some of these threads of various colors have one kind of power, and some another. For instance, red light has far more heating power than violet light, which has practically none at all, while red light will soon show its power on a thermometer. Now, the kind of light that has the power of causing chemical changes, which is the light we photograph by, is mainly violet light, or the violet part of white light. We can see, in a way, by red light, but red light has practically no influence on photographic plates. We may say that photographic plates cannot see red light, and so we can use it to develop them by, without fearing that the photograph of our faces or the walls of the room will be printed on the plates.

Why Houses Seem Crooked When We Look Above a Street Fire.

Light is always bent in some degree by the various things through which it passes—as when it passes through the air to our eyes from a star, or as when a stick, half in water, seems to be bent. Now so far as light is concerned the air is different according to its warmth. Warm air is less dense than cold air, and when light passes from one to the other, in either direction, its path is more or less bent. So when we look at the houses through the hot gases that rise from a watch-fire, the light, as it travels from the houses to our eyes, is bent in passing from the cold air through the hot gases, and is bent a second time in passing from the hot gases through the cold air again.

Also, as the fire does not give off the same quantity of gas at every moment, the light is bent in different ways, and not only do we see the houses crooked, but they seem more or less crooked as we keep on looking at them. This bending, or breaking, of the rays of light as they pass from one thing to another is called refraction, which simply means breaking, and is very important in every way. Just as you see the houses crooked when you look at them through the gases from a fire, so we see all the stars crooked when we look at them through the air. The light from the stars is bent as it passes through the air, and so we do not see stars where they really are, but always a little distance from the real place, because of the refraction of their light.

Why Flowers Smell Sweeter After Rain.

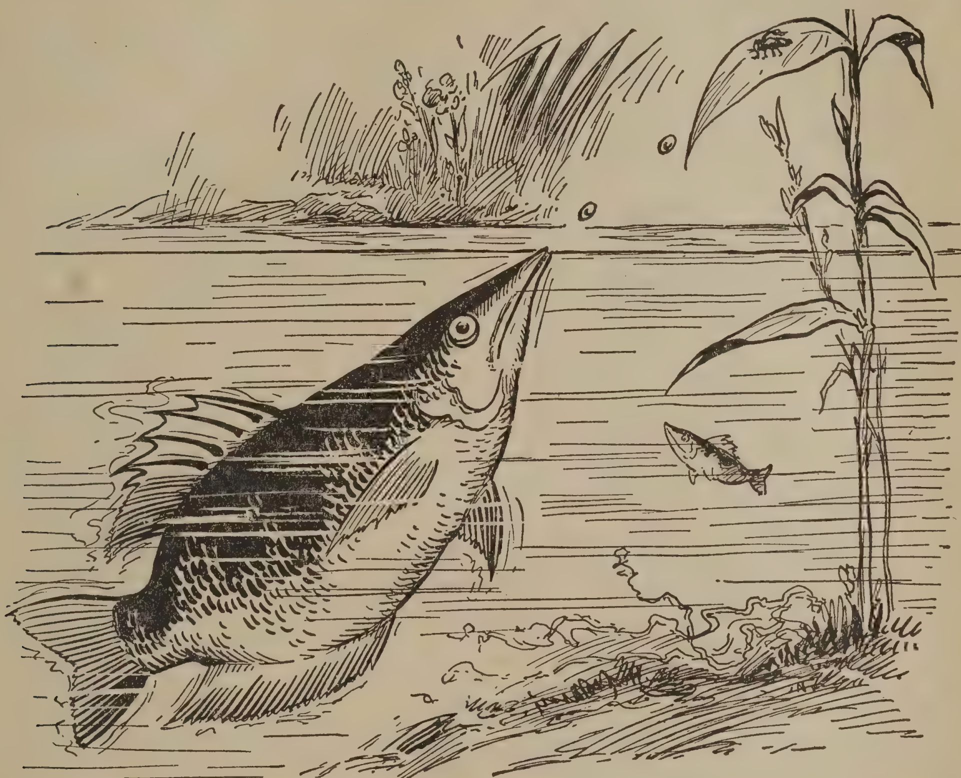
Where there is any vegetation rain has a great influence in making the air smell fresher, for water has a special power upon the activity of many kinds of vegetable life that produce pleasant scents. We say that the rain brings out the fragrance of the flowers, and that is true. All life requires water, and all the processes of living creatures are helped by a good supply of water. When rain falls on flowers, and on many kinds of leaves, it sets going the chemical changes which result in the production of many pleasant odors which are added to the air and so help to make it smell "fresh."

Why Animals In Snowy Countries Wear White Coats.

The use of the white coat is to protect the animal from its enemies by making it difficult to see. If the animal keeps still it can scarcely be seen at all when its coat is the same color as the snow. But if it had a white coat in summer, when the snow goes, it would be easily seen, and so often its coat changes in summer, and the fur takes other tints, more like the color of the ground and the plants among which it lives. This is called protective coloring, and is very useful to many animals. But sometimes it happens that an animal which lives by catching others is

also white in winter snow, so that it can get near its prey without being seen. Some insects do the same thing, and when they sit quietly among the leaves of certain plants no one can tell which is insect and which is leaf, so the birds cannot find them. When you turn to read Modern Warfare, you will see how men make use of this same principle.

In the wall of the capsule which contains the internal ear there is a thin spot, and it is through this thin part, corresponding with what we call the drum of our own ear, that the sound is conducted. Thus, we see that in the case of some of the fishes there has been a change of function of an organ which was in the first place a gill, but has now become part of the hearing apparatus. In other words, it is a structure at one time used for breathing, but now used for hearing.



Can a Fish Hear?

Although fishes are like some other animals in having no visible signs of ears, yet they have them and they serve to conduct sound to the brain. Their organ of hearing consists simply of an internal ear placed inside a gristly capsule. In some fishes—as, for instance, the dog-fish—there is a fold known as the false gill, which is no doubt the remains of a real gill, but is now used for transmitting sounds to the internal ear.

The Fish That Goes Hunting.

This fish may or may not have good ears but he has good eyes and likes to hunt flies and other unwary insects that light on leaves or grass stalks near him. He is called the archer and he shoots bullets of water with sure aim. That fly

will soon provide him a nice lunch. Mother Nature has provided all her children with means to supply their needs. She gives boys and girls brains and asks that they be used.

What Keeps a Train of Cars On the Rails?

A great many boys will think they know the answer to that. They will say it is because of the rim, or flange, that is on the inside edge of the car wheel. That rim merely steadies the car—keeps it running smoothly. But notice the next time you go to the railway station, that the rail is not flat on top. It is slightly rounded. If a freight car is standing on a side track you will see that the rim of the car wheel is not flat, either, and it does not rest squarely on the top of the rail. Beside having a ring-like flange on the inner edge, the broad rim of the wheel slants much like a cork that is made smaller at one end so it can be pushed only part way into a bottle. The outer circumference of a car wheel is smaller than the inner. And the wheel rests on the inner slope of the rounded rail.

Why Does Salt Make You Thirsty?

At all times there is present in our bodies a certain amount of salt. This is necessary and as long as this amount is not materially increased we do not feel that we have too much salt. However, when we eat too much salt the body calls for water or something to drink in order to dilute or counteract it. It is merely nature's way of keeping in the body the right proportions of all the different elements so that we may have perfect health.

Where Do We Get the Expression "Kick the Bucket"?

Unlike the origin of many or most of our expressions this one seems to have had from the first the same meaning as it has today. The tradition is that a certain man named Balsover became tired of existence and resolved to leave this mundane sphere. To accomplish this he stood on a bucket while arranging to hang himself and tied a rope around his neck and around a beam that he could not reach without the aid of the pail. When all was ready he kicked the bucket out from under his feet; and so succeeded in carrying out his own wishes and originated an expression which still means to die.

What Is the Cause of Dimples?

Just under the skin in the tissues are many little fibers which help to hold the skin firm. Some of these fibers are long and some short, and they run in all directions. It sometimes happens that they grow short in one spot and pull the skin in, making a little depression, and producing a pleasing effect. This may be intensified when one laughs. Some attempt has been made to produce dimples by surgical operations, but without much success.

What Do We Mean by 22-Carat Fine?

In its pure state gold is too soft to be used for jewelry or coins, and other substances, usually copper, are added to make it harder. These substances are called alloys, and the amount of alloy in proportion to the amount of pure gold determines the fineness of the jewelry or coin. In arranging this basis of marking things made of gold, absolutely pure gold is spoken of as 24 carats. Then if two parts of alloy are added we have a metal which is only 22 parts real gold, and we speak of it as 22 carats fine. If six parts of alloy are added, there are 18 parts of real gold and we say it is 18 carat fine, and so on. Ordinary jewelry is seldom more than 18 carats or three fourths pure gold.

Why Do Our Eyes Sparkle?

If you will notice carefully someone who is very happy and merry and whose eyes are sparkling you will probably see that their eyelids are fairly dancing up and down. Now, remember that each time they do this a tiny tear is released

which spreads all over the eye and washes it clear and bright, and the clean moist surface reflects the light and makes the sparkle which we all love so well to see.

Why and What Is Smoke?

If you have good fuel and make the right kind of a fire there will be little if any smoke. Smoke is produced when the fuel is burning imperfectly and little particles of the coal or whatever else is used go up the chimney. Nowadays in the cities where much smoke is undesirable devices are used through which the smoke passes which insure that everything is thoroughly burned and consequently almost no smoke escapes.

Why Does An Apple Turn Brown When Cut?

In an apple are quite a number of different chemicals. As long as the peel is unbroken these are protected against any action of the air, but just as soon as the peel is broken the oxygen in the air begins to cause chemical changes in the apple. These are commonly called "ferments." The brown color results from these chemical changes. This action is similar to that of the air on damp steel or iron. Then it is called rust. But rust is not a ferment. When anything is rusting it is actually burning, very slowly, of course, but it is being oxidized or burnt.

Where Did We Get the Names for the Months of the Year?

January was named in honor of the Roman god Janus, the two-faced keeper of the doorway of heaven; February for a Roman feast held in that month; March for the Roman god Mars. The origin of April is uncertain. May is named for a mythical character, Maia, supposed to have been a daughter of Atlas; June probably for the goddess Juno, though possibly for the Roman family Junius; July for Julius Caesar, who was born in that month and named it after himself; August for his nephew, the Emperor Augustus. September, October, November and December (formed by adding "ber" to the Roman numerals septem, octo, novem, decem) mean "seventh," "eighth," "ninth," and "tenth," respectively, because they held those places in the old Roman year, which began with March. Our present calendar was introduced by Pope Gregory XIII in 1582 and adopted in England and America in 1752.

Why Does Water Run Off a Duck's Back?

The duck has an oil gland which is constantly producing fat or oil. This the duck uses to give his feathers a thin coat of oil. You know that oil and water will not mix, so the water rolls off without soaking in. The duck's feathers are so thick that even if it were not for the oil the water would have considerable difficulty in soaking through. Other birds which live in the water have this oil gland and that is why their feathers never get wet.

How Much Snow Is Equal to An Inch of Rain?

The density of snow depends a great deal on the temperature. In cold, crisp weather when the thermometer is hovering around the zero mark the snow comes down light and airy, but when it is barely freezing the snow falls in large flakes that are already partially thawed. In this state it occupies much less space than when it falls in real cold weather. A cubic foot of water weighs 62½ pounds and a cubic foot of freshly fallen snow weighs about 5½ pounds so that it would take about 11 inches of average snow to be equivalent to an inch of rain.

Why Does Wood Float?

A piece of wood floats because it is lighter than the same amount of water. We mean by that, that if you were to take a piece of wood weighing a pound and measure it you would find that it took up more space than would a pound

of water. Another way of expressing it is to say that wood is not as dense as water. We mean by this saying, that the particles of water are closer together than those of wood, and that there is more air in a piece of wood than there is in the same amount of water.

Why Does Iron Sink?

Reasoning the other way from that showing that wood floats because it is lighter than water, we easily see that iron sinks because it is heavier. Measure a pound of iron and you will find that occupies considerably less space than a pound of water. While the particles in a piece of wood are farther apart than those in water, yet in iron they are so close together that there is no room for any air, and consequently the density of iron is more than that of water.

Why Does Iron Get Red Hot?

When a piece of iron is sufficiently heated, it gives off light of its own. Getting red is only one stage in this development by heat to the point where it makes its own light. If you heat it still more, it will give off a white light, and if you continue the process it will melt and change its form.

What Causes Hail?

Hail is the name given to the small masses of ice which fall in showers, and which are called hailstones. When a hailstone is examined it is found usually to consist of a central nucleus of compact snow, surrounded by successive layers of ice and snow. Hail falls chiefly in spring and summer, and often accompanies a thunderstorm. Hailstones are formed by the gradual rise and fall, through different degress of temperature (by the action of windstorms), and they then take on a covering of ice or frozen snow, according as they are carried through a region of rain or snow.

With regard to rain, it may be said, in popular language, that under the influence of solar heat, water is constantly rising into the air by evaporation from the surface of the sea, lakes, rivers, and the moist surface of the ground. Of the vapors thus formed the greater part is returned to the earth as rain. The moisture, originally invisible, first makes its appearance as cloud, mist or fog; and under certain atmospheric conditions the condensation proceeds still further until the moisture falls to the earth as rain. Simply and briefly, then, rain is caused by the cooling of the air charged with moisture.

Why Are Our Fingers of Different Lengths?

There is no known reason why our fingers should be of different lengths today; in fact it is thought by some people that the hand would be stronger if the fingers were all of the same length. Certainly, however, the hands would not then be so beautiful, and it might not be so useful. The human hand today is perhaps the most versatile thing in the world. You can do more things with the hand than with any other thing in the world. The probability is that the shape of the hand today and the length of the fingers are the result of the different tasks demanded of the hand during its development.

We must go back to the time, however, when men walked on fours, for that is probably the real explanation. Originally man's fingers were of different lengths because all four-footed animals had the same peculiarities. The shape and length of the toes and their arrangement were the ideal arrangement for giving the proper balance and support to the body, and in moving about and in climbing produced the best toe hold.

Why Does Frozen Water Burst Pipes?

Nearly everything we know is expanded or swollen by heat, and contracted or shrunken by cold. But water is queer. Its particles huddle closest together, and fill the smallest amount of space when in a liquid state. And it is ex-

panded by both heat and cold. When heated to the boiling point and turned into vapor it takes up the most space. Steam confined in a boiler bursts iron walls, if it can get out in no other way. So in freezing, water expands to a larger bulk, that is for a few degrees of cold. That is why ice floats in water. If the water happens to freeze in a pipe, where there is no room for it to expand, it bursts the pipe. Some people think the thawing bursts the pipe.

Why Do a Cat's Eyes Shine In the Dark?

To shine in darkness a body must be luminous, or light giving, and no creature possesses luminous eyes. A cat's eyes appear to shine in the dark because its very wide-open pupils catch what light there is, even collecting rays which are not visible to us. By reflecting this light the cat's eyes appear to shine with a light of their own.

What Animal Uses a Lamp While Fishing?

Far down in the depths of the ocean where there is always a semi-darkness is found a fish called the "deep sea angler." He goes about with a small luminous knob projecting from the top of his head. This attracts curious small fish, and while they are investigating it, the angler fish makes a quick dash and secures them for his food.

What Insect Carries a Lamp More Efficient Than the Best Artificial Lamp Invented?

Perhaps the greatest problem of the modern lighting engineer is to perfect a lamp that will give the most light with the least heat waste. In a gas jet only about two per cent of the energy is transformed into light and in a good filament electric light not more than eight or ten per cent. The efficiency of the firefly's light is estimated at one hundred, there seeming to be no waste whatever in heat.

What Animal Fills Its Legs With Water When It Walks and Folds Them Up When at Rest?

The starfish has hundreds of tiny hollow legs that it inflates with water when it wishes to walk. It reaches these feet out to some object and with the aid of a sucking disk on each foot pulls its body forward.

Which Is Stronger In Proportion to Its Size, a Bird or a Man?

A bird is said to have five times as much energy as a man. When we take into consideration the immense distances that birds fly and the speed they attain we can readily believe this. In order to keep up this supply of energy birds must eat a great deal more in proportion to their size than is required by a man.

Why Do We Have to Learn to Swim?

With the exception of man, and possibly the monkey, all animals swim naturally. Of course, some can swim better than others, but with the exception of the two just mentioned all can manage to keep afloat for some little time at least. Man's natural motion is climbing, and this motion is not adapted for swimming. This motion is just as much an instinct in man as swimming is in a duck, and therefore before a man can swim he must learn.

Of What Use Is My Hair?

Long ago man's entire body was covered with hair, just as some animals are today, as a protection against heat and cold. But man has worn clothing so long that the need of hair for protection from the elements has disappeared, and so has hair, excepting on the top of the head and the face. It is believed by many that the time is coming when human beings will have no hair. Today it is of use only as an ornament.

Why Do They Say Wisdom Teeth?

The last teeth to grow are called the wisdom teeth. They usually arrive be-

tween the ages of twenty and twenty-five years. By that time a person is supposed to have arrived at the age of discretion. It does not mean that a person is wise when these teeth come, but that he has passed a sufficient number of years to have come by that time to an age of discretion or wisdom. As a matter of fact, these teeth grow at about that age whether one is wise or not.

Why Does Not My Hair Hurt When It Is Cut?

There are no nerves in a hair, and anything that does not contain nerves cannot be hurt. There are nerves, however, in the root of a hair and for that reason it hurts when your hair is pulled. The same condition is true of your finger nails. There is no feeling at the ends of the nails, but where they join the skin there are a great many nerves and an injury there is very painful.

Why Are Canary Birds Used In Mining?

Canaries are very susceptible to the presence of that deadly odorless gas, carbon monoxide, which occurs in mines after an explosion. Men entering the mines take with them a caged canary, which will show the effects of the presence of the gas long before a man could detect it. In order to revive the canaries a cage has been made which carries a supply of oxygen that can be set flowing by closing the cage and will revive the bird immediately.

What Causes a Mirage?

A mirage is the reflection of distant objects in the sky. Near the horizon one will sometimes see what looks like a city or an island or trees, but is really a reflection of some object that is beyond the range of one's vision. These reflections are caused by a sudden change of density in the atmosphere. This condition may occur anywhere at any time, but is exceedingly rare outside of the most heated regions of the desert or over stretches of ocean. The reflections are upside down and are modified in color by the blue haze of the air. For this reason reflections of sand hills and barren plains may look like cities and great lakes of water, deceiving travelers whose vision is already strained by the intense glare of the sun. The curving of a ray of light as it is refracted through layers of air of different densities will also distort the image. A mirage, therefore, is not an optical illusion, but a real reflection. There is a section in the United States where this phenomenon is very common. Can you suggest where?

How Many Bees Are There In a Swarm?

The number of bees in a swarm will of course depend upon the size of the swarm. The size of the swarm may vary greatly, depending upon the strength of the hive from which it came, the time of the year, etc. A weak swarm may contain not more than ten thousand bees while on the other hand a strong one may have as many as eighty thousand bees.

Why Do Animals Prick Up their Ears at a Sound?

In ourselves and in most of the higher animals we find a pair of organs projecting from the head which are the only parts of the organs of hearing that we can see, and which we therefore call the ears, though they are by far the least important part of the whole organ of hearing, especially in ourselves. The real use of the outer ear is to catch the waves of sound, and in animals there are small muscles which enable the opening of the ear to be turned towards the sound, and it is for the purpose of catching more sound waves, and consequently hearing better that an animal pricks up its ears. Have you a pony? When he sees you some distance away does he not prick up his ears? He seems to think perhaps you are calling him, so he listens more carefully Or when your horse sees any strange thing he points

his ears towards it, he wishes to be sure whether any sound is coming from it.

How Did a Spider Once Save the Life of a King?

The story is that once when Robert Bruce, the future King of Scotland, was hard pressed by his enemies he took refuge in a cave. A spider, with marvelous rapidity spun a web over the entrance, and the soldiers of the enemy seeing the web across the entrance thought he could not have gone in there, and in their haste passed on.

How Burglars Are Caught by Their Finger-Prints.

You have heard, perhaps, that nowadays burglars wear gloves in order to avoid leaving their finger-marks on a window-pane or anywhere else. The fact is that all men and women differ from each other in little things, and there is nothing in which they differ more certainly than the pattern of the little ridges on their fingers. Two patterns exactly the same from two different people have never yet been found. These patterns cannot change, for they are formed by the innumerable mouths of the tiny canals which convey the sweat from the deep-seated sweat glands to the surface. They can be destroyed, of course, but no different pattern can be put in their place.

Thus, of all the ways of knowing who is who, this is the most certain, as well as much the simplest and cheapest. It is now being more and more used. If a man's thumb-mark is the same as the mark on a piece of paper where a theft was committed, the evidence against him is very strong. A bad man who has become known to the police may change his clothes and the appearance of his face, he may look like a different person, and have not the slightest resemblance to the photograph taken of him, but his thumb-mark will tell him at once. This is now known as the Bertillon System.

How Many Words There Are In the English Language.

A dozen great scholars might give as many answers to this question. One of them, some years ago, gave the number as only 38,000. But a still greater scholar, Professor Max Muller, who was perhaps the greatest authority of his time on words, put the number of words in the English language at 100,000. He compared the growth and development of our language with the putting of grain in a sieve. Most of the chaff has been winnowed off, and with it have gone many good grains. Good old English words, which we now consider only dialect words or "Americanisms," have gone out of the language. If we include all the words which have fixed places in the dialects of the country, and include also many which we know were spoken in earlier times, we shall have to put the total at 300,000 for the English language.

That number is constantly growing. Words have to be invented for new industries, and they become part of the language. When a new dictionary was made, not many years ago, it was found that the new words necessary for use in relation to electricity and electrical appliances numbered over four thousand. A similar increase had taken place with regard to other arts and sciences. Most of them are purely technical words, but, little by little, they become common words as all of us know more about science; and so the language grows.

Why Can You Blow Out a Candle?

When you light a candle it burns, because the lighted wick heats the wax sufficiently to turn it into gases, which mix with the oxygen in the air and produce fire in the form of light. You know it is not easy to light a candle quickly. You must hold the lighted match to the wick until the wax begins to melt and change to gases. As long as the wax continues hot enough to melt and turn to gas the candle will burn until all

burned up; but if there is a break in the continuous process of changing the wax to gas, the light will go out. Now, when you blow at the lighted candle, you blow the gases which feed the flame away from the lighted wick, and this makes a break in the continuous flow of gas from the wax to taper, and the light goes out.

Why Does a Stick Seem to Bend When Put In Water?

When light passes from one medium to another, as for example from glass or water to air, or from air or glass to water, the rays of light change their course, thus making them seem to be bent or broken. The rays of light from the part of the stick in the water take a different direction than the rays from the part which is out of the water, giving the appearance of breaking or bending at the place where the air and water meet. It is, of course, the light rays which are bent and not the object itself.

This bending or changing of the path of light rays is called refraction. If you place a coin in a glass of water so that it may be viewed obliquely, you can apparently see two coins, a small one through the surface of the water and another apparently magnified through the side of the glass.

This is due only to the absolute principle that rays of light change their direction in passing from one thing to another, and on this principle of the rays of light our optical instruments, including the microscope, the telescope, the camera and eyeglasses are based.

Why Do My Muscles Get Sore When I Play Ball In the Spring?

They do this because you have probably not been exercising the particular muscles which you employ in throwing a ball enough in the winter to keep you in good condition. Muscles which have been developed through use or work need more work to keep them in condition. In a sense certain of the muscles which you employ in playing ball have been treated during the winter very much as if you had tied them down. You have not been using them—they have not been doing enough work, and they begin to lose their strength when for any period they have not been used enough. The soreness that you feel is the natural condition that arises when you begin to use a muscle that has been idle for some time. There is a lesson for us in this. Don't you know all your mental faculties may be considered as mental muscles? You have been exercising them in school. After school and through life, if you wish to keep mentally alert through life, you must keep up study, reading and reflection.

How Was the Flag Made?

The design of our flag was outlined in a congressional resolution passed on June 14, 1777, which stated "that the flag of the thirteen United States be thirteen alternate stripes red and white; that the union be thirteen stars, white in a blue field, representing the new constellation." After Vermont and Kentucky had been admitted to the Union, Congress made a decree in 1794 that after May 1, 1795, "the flag of the United States be fifteen stripes alternate red and white and that the Union be fifteen stars white on a blue field." This made the stars and stripes again equal and it was the plan to add a new stripe and a new star for each new state admitted to the Union. Very soon, however, it was realized that the flag would be too large if we kept on adding one stripe for each new state admitted to the Union, so on April 4, 1818, Congress passed a resolution reducing the number of stripes to thirteen once more to represent the original colonies, and to add only a new star to the field when a new state was admitted to the Union. At that time there were twenty states in the Union. Since that time none of the flags of the United States have more than thirteen stripes while a new star has been added for each state until now we have forty-eight stars, representing the forty-eight states.

What Makes a Bee Hum?

A bee is not the only insect that makes a noise we can hear. We are sure you know about the singing of a mosquito, and many mornings when you wish to sleep the droning of the flies wakes you. But you never heard any of these noises when the insect making them was at rest, or simply crawling about. This confirms what we may have guessed, that the bee's humming is made by the movement of its wings when it flies. The noise is not made by its voice-box, as when you sing, for the bee has no voice-box. But its wings move very quickly, and as they move to and fro, or vibrate, or tremble, they set the air moving, and you know that waves in the air make sound when we hear them. Did you ever hear a humming bird? Why do not birds generally make a humming noise when they fly?

What Makes Snow White?

Anything is white or blue or green or yellow, according to the kind of light it sends back (reflects) to the eye. Now, snow is water, to be sure, but it is water in a peculiar form. It is crystallized water. Each single snowflake is a beautiful crystal, and in the minute cells of the crystal considerable air is entangled. A great many things, when air is entangled in them, reflect all the rays of light to the eye, and so seem white, which is the natural color of light. But we must not suppose that air is always necessary to make things appear white. On lakes you notice the white caps, or breaking crests of waves. They are white for the same reason that snow is white. So is the foam on top of soda water, or a mass of soap suds, and it makes no difference what colored soap has made it. Each single flake being white, when snow is gathered in masses, as when it lies deep on the ground, it makes everything seem to be covered with a mantle of white. Did you ever notice the crystals of snow? They are not always of the same shape.

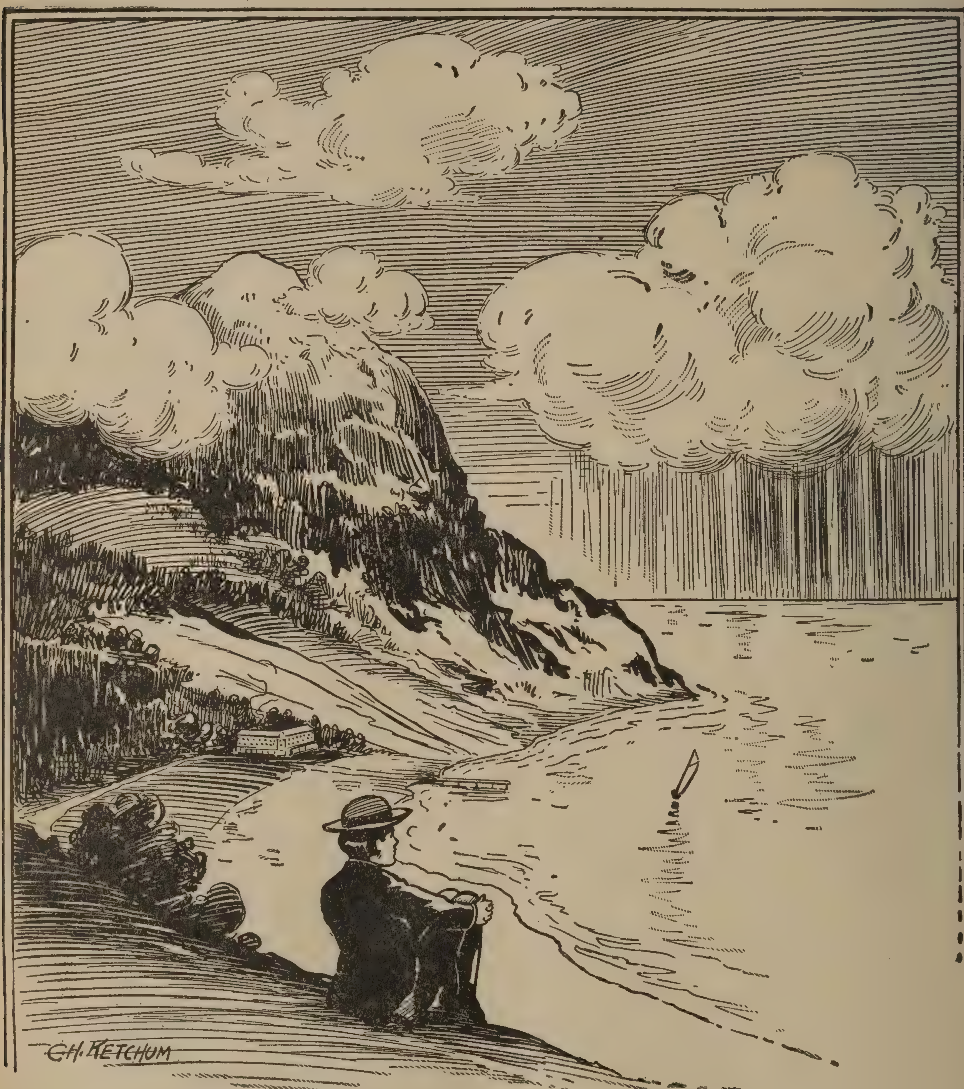
Why Are Dewdrops Round?

Not only dewdrops, but drops of rain are round. Water is a liquid; that is, the little particles of which it is composed are free to move. Drops of all kinds of liquid, whether you are talking about water, milk, oil, melted iron, or any other liquid, are always round, because there is a force that holds them together and forces them into the smallest possible space around a center. When you study geometry you will find that such a shaped body is a sphere—that is, shaped like a marble. Ice, you know, is solid or crystallized water. It exists in any shape, because its particles (as is true of all solid bodies) are not free to move; but when it melts—that is, becomes liquid—the water dropping from it is always in the shape of round drops (the particles are free to move and press closely around the common center), and if you could freeze them as they fall, they would form little round pellets of ice. Rain, you know, falls in drops. Did you ever see hail? Now, you know how it is formed, but how do you suppose it is formed on a hot summer day? They are drops of rain formed high in the air where it is very cold and they freeze; having a considerable distance to fall, they are moving pretty fast when they strike the ground and are capable of doing a great deal of damage, knocking fruit off the trees, cutting down grain in the fields and vegetables in the garden. Now, a question for you: In making shot that hunters use in their guns, melted iron is dropped through sieves from high towers. Will you tell us why?

Why Do Not the Clouds All Look Alike?

Because the conditions under which they are formed are very different. Some are formed much higher in the air than others, where the moisture, temperature, and pressure all differ from what they are lower down. The winds, state of the air, electricity it contains, all have an influence. If you are inter-

ested and will watch the clouds, you will soon be able to point out and name several different kinds of clouds. Highest of all, five or six miles above the earth, you notice feathery, curling wisps of clouds; they are cirrus clouds. (Cirrus means a curl.) Then below them, especially in summer time, you will often see great billowy masses of clouds like those you have enjoyed looking at and thought you could see cloud forms that looked like giants, or houses, or great rounded hills. These are called cumulus clouds. (Cumulus means a heap.) Great storm clouds from which rain is often falling are nimbus clouds. (Nimbus



"WHY DO NOT THE CLOUDS ALL LOOK ALIKE"

means cloud.) Low in the sky, you will often notice long bands of cloud lying in great layers across the horizon; these are stratus clouds. (Stratus means a layer.) All know what fog is, but perhaps you do not know it is a cloud so low that it rests right on the surface of the earth. Are there any clouds in sight when you read this? What kind are they?

Why Is a Tiger Striped?

Did you ever see a little lizard they call a chameleon? They are harmless little animals that have the strange power of changing their color to make it like their surroundings. If you put one out on the lawn it will soon be green in color; then if you place it in the center of a red carpet it will soon turn red. The explanation is that nature is kind to all forms of life and provides various devices that serve to protect from enemies and also help to secure food. One of these devices is to give them a color like the scenes among which they live, so that they will not be readily noticed. The lion loves the open ground, so its fur has become a mixture between yellow and grey, like the sand and rocks. The tiger hunts in marshes or among long reeds and grass, so its coat is a fawn color with stripes of black, or a color almost black. When it crouches down among the reeds or tall grass, it looks like the ground with shadows of the reeds showing on it. We are sure that you can now tell at least one reason why some of the animals you see in a zoo are colored as they are. Can you tell why the polar bear is white? Do you think it all chance that birds whose home is in tropical forests where flowers are so brilliant have such beautiful plumage?

How Do You See Yourself in a Glass?

We only see an object because rays of light coming from that object strike the eye. Now it makes no difference how bent or crooked that ray may be, if it reaches the eye we will see the object. A mirror, you know, is glass with some mercury amalgam (mercury combined with tin) on the back of it, forming a splendid reflecting surface. That is a surface such that rays of light hitting it bounce, just as a ball bounces when you throw it against a wall or the sidewalk. If you stand directly in front of the wall and throw the ball against it, you know the ball comes bounding back to you. When you stand directly in front of a looking-glass, the rays of light going from you to the glass come back to you, just as the ball did, and you see yourself through the reflected (thrown back) rays of light. You must remember that you can see by means of a bent ray of light just as well as if it were straight, for this fact will explain a great many things you will hear about later on. For instance, men in a submarine (a boat down under the water) can see what is transpiring on the surface by means of a periscope, a steel tube with a mirror at the top, so arranged that the rays of light reflected from its surface go straight down a tube to the man at the other end, under the water. Do you think you could arrange mirrors so you could see things on the other side of a house?

Why Do We Have to Breathe?

When you breathe, the air which is around us on all sides passes into the lungs. You know that a very large part of the air is a gas called oxygen. Now, oxygen is such a friendly gas that it readily unites with a great many other substances; that is to say, it oxidizes them, which is only another way of saying they burn. This burning may be very slow, as in rusting iron, or it may be fast, as when we build a fire. You also know that we burn up rubbish and useless material. Nature, also, has a great deal of rubbish to burn up. Every minute that we live, sleeping or waking, many of the countless cells in our body become useless, and nature must get rid of them, replacing them with new material from the food we have eaten. Part of this worn-out material is carried by

the little blood cells to the lungs, where it is burned, that is, oxidized, by the air just breathed in; then the blood cells load up with a supply of oxygen and start on their return journey to all parts of the body, and the oxygen they carry is used to still further burn the body rubbish. You know your body is warm all the time; a large part of this heat comes from the burning that we have just told you about. What is true of us is true of all forms of life (unless some very low forms are meant). All must some way breathe, that is, get oxygen. Breathing, being absolutely essential to life, is involuntary, that is to say we do not have to think about it; but even more, it is so necessary that nature does not allow you to trifle with it to any extent. Try holding your breath. You can do it for a little while, but pretty soon nature pushes you to one side, so to speak, and you breathe whether you want to or not.

Does a Worm Breathe Under Ground?

Every living thing breathes, whether in earth, on the earth, in the sky, or in water. If it can not get air, it dies. The worm really has no trouble at all, for there is plenty of air, and to spare, in the earth, anywhere near the surface. Of course, if you dig deeply into the earth, there will not be enough air for a thing like a worm, which needs a good deal; and you will find only living creatures, like some microbes, or tiny plants, that need very little air. Further down still, you will find no living things at all.

How Do Little Chickens Breathe Before They Are Hatched?

As soon as life has started in the egg, the little growing chicken or bird of any kind needs air. There is a very small quantity of air in the egg to start with, for you know in every egg there is an air chamber. But that would not last very long. There is, however, no lack of air. Nature has made the shell porous, which means that air can pass through it, and thus the little chick lives until it is big enough and strong enough to break the shell. Thus you see that in one way or another nature provides air for her myriad forms of life. Since air is so necessary you must be sure and get your share of it, by keeping your living and sleeping rooms ventilated.

How Do Fishes Breathe Under Water?

This question shows that you are thinking. If all forms of life must have air, you want to know how fishes can get it under water. Well, in the first place, most water contains a good deal of air that in one way or another has become mixed with it. We learned that air will soak up water; now we learn that water in its turn will soak in air. So the air is in the water for the fishes; the question is, How do they get it? If nature were to fit them out with lungs, they would have to take in lots of water and the next instant throw it out again. That would make a great deal of unnecessary work, and nature always cuts out such work.

To accomplish her purpose, she provides fishes with curious organs, called gills. You have seen these openings on the sides of the fish's neck. The water is simply taken in at the mouth and only a little ways further on passes out by the gills, but before doing so it passes through rows of little filaments (hair-like processes) where the air comes in contact with the blood that has been sent to these minute filaments, just as it does in the very small lung cells of animals with lungs. This shows you in what wonderful ways nature adopts means to ends. Three-fourths of the earth's surface is water, which ought to be utilized as an abode for life. We have now learned the principal means nature takes to accomplish that purpose. Do you now see one reason for giving goldfishes fresh water?

Do Plants Breathe?

Yes, indeed, plants form no exception to the general law that all living things require oxygen, which is derived directly

or indirectly from the air; and nature has provided plants, not less than animals, with special organs wherewith to obtain oxygen from the air. To animals that live in the air, she gives lungs entirely within the body; to animals that live in the water, she gives gills, which are modified lungs moved up to the neck. In the case of plants, the leaves serve for lungs, mouth, and stomach. Though we must understand that leaves are only the principal, not the sole, organs that serve these various purposes, other parts of a tree can also absorb air, take in nourishment, and prepare it for plant growth. But the leaves are the real lungs of trees.

When we ask how leaves enable a tree to breathe, we learn they are very wonderful structures and illustrate once more the marvelous means nature employs to accomplish her purposes. On the sides of a leaf are many thousands of minute openings, called pores, which, like the little cells in the lungs or the filaments in the gills, bring the oxygen of the air in contact with the sap (which is the blood of the trees), where it acts just as it does in the case of animals, burning up some rubbish and being carried off to the other parts of the tree by the sap cells.

This breathing goes on day and night as long as the leaves are active, but you know the leaves fall off of most trees in the fall and the tree as a whole takes a good long rest during the winter. To show you how necessary breathing is to plants, if you would put a little bush under an air-tight glass covering, it would, of course, get light and heat, but, as it can not get fresh air, it will die, just as surely as you would if shut up where no fresh air could reach you.

Why Does a Cat Have Whiskers?

Because a cat can go about so safely and rapidly in the dark without injury to himself or without running into things, nearly everyone believes it is due to the fact that he sees quite well in the dark. That a cat can see, to a certain extent, in the dark is quite true, but it is doubtful if he could go about so rapidly in total darkness as he does if it were not for his long whiskers. Take a look at a cat's whiskers and you will see they are always as long as, generally longer than, his head is wide, and a cat's head is as wide as his body. These delicate hairs are wonderful mechanisms. Each one grows from a follicle, or gland, nerved to the utmost sensibility. Its slightest contact with any obstacle is instantly felt by the animal, though the hair itself may be tough and insensible. The next time you go to a zoo or a park where they keep wild animals, take a good look at the lions and tigers and you will see they have similar whiskers. This is because they are all cats, sort of big brothers and sisters to the ones you play with. Does a rat or mouse have similar whiskers? Do you think the feelers on ants and other insects are anything of a similar nature?

Why Is a Dog's Nose Always Cold?

We know you like your dog, but you can not help a little shiver when he pokes his cold nose in your hands, and you wonder why, when his body is so warm, that this one spot should be different from all the rest of him.

Let us first tell you an interesting old story about it. When Noah tried to get the animals into the ark some of them were troublesome and he had to have a dog help him. Because of this the dog was the last animal to get in and the ark was then so full that the poor dog had to stand in the doorway with his nose outside, in the wet, and it has never been warm since.

Science, however, gives an explanation which shows us there is always some good reason in explanation of unusual things about animals, plants or our bodies. The coldness of a dog's nose is, it says, due to the fact that it must be kept moist all the time in order to sharpen his sense of smell. And, of course, as the moisture evaporates, it keeps his nose cold.

A dog depends a great deal on his powers of smell, especially in the wild state, and it is because of his keenness of scent that he is valuable to man for hunting purposes. In addition to the usual smelling nerves inside a dog's nose, the whole black point of the nose is very sensitive, but it can only be kept so by moisture. Thus it is that when a dog's nose is dry and warm he is ill and needs doctoring.

What Makes the Clouds?

We have already told you that air acts like a great sponge and soaks up water which is afterwards given out if anything robs the air of its heat. But when air charged with water begins to lose its heat, it does not at once begin to rain; such of the water as is squeezed out forms a fine mist which is still lighter than air and floats away as a cloud. You have seen this mist rising from the surface of water, or, if you live near mountains, you have often noticed the tops of the mountain "smoke," that is, the mass of warm, moist air coming in contact with the cold mountain top loses some of its heat and water in the shape of mist is being squeezed out; and you have, or at least can, often see this process going on high in the air. You will notice a thin mist of cloud form, grow larger and unite with other little pieces until, especially in the summer time, you see great billows of clouds formed. But, since clouds are lighter than air and are blown along by the wind, the clouds we see moving above us have often been formed many miles away. Did you ever notice clouds moving in different directions at the same time? One of the clouds is considerably higher than the other. What makes the wind blow in those different directions? Read the answer to that question and see if you understand it.

What Is Wind?

You, of course, know that wind is air in motion, but you want to know what makes it move. You also know that there is a great ocean of air resting on the earth's surface, the same as oceans and lakes of water, and that we are living and moving at the bottom of this air ocean. Now we will tell you a very strange fact. The sun is, of course, shining on this ocean of air all the time but the heat that comes directly from the sun does not heat the air. The sunbeams have first to strike the surface of the earth and bound back (be reflected back) before they can heat the air.

So the heat (temperature) of the air depends on that of the surface of the earth underneath it, but some parts of the earth's surface get more heat than others. Some parts near the equator are warm all the time; some parts of the United States, like Florida, have more heat than other parts, like Montana. So the air in some places gets more heat than in others. But hot air expands; it is lighter. You know this, for you have used hot air to send up little balloons on the Fourth of July. So, over these hot places on the surface, the air rises and cooler air begins to rush in (or blow in) to take the place of the air that has risen. Now you see why we have winds on the surface. From what direction is the wind blowing, the day you read this? Is it warmer or colder than it was the day before? Do you know what a hot or cold spell means in the weather?

What Makes It Blow From Different Ways?

Have you ever noticed little eddies and whirlwinds in the street? All of a sudden, a gust of wind comes and dust and straws or paper begin to whirl around and rise in the air. Such eddies are only little baby affairs compared with what is happening every day. We have just seen that the heated air over a large section of country rises and cooler air flows in to take its place. But that rising air is sure to form a whirlwind which may be hundreds of miles across and so large we do not know it

is a whirlwind. It, however, is a real whirlwind and acts in the same way, only on a very large scale. You noticed that the little whirlwind of paper and straw moved off down the street; the big whirlwind also begins to move off across the country. If you will look on a weather map in the post office, you will notice little circles drawn around some sections and in the center the words "low" or "high." The next day on the weather map you will notice that those centers have moved, sometimes several hundred miles. That means that a big whirlwind has moved that distance. If it be a whirlwind, the wind is blowing in all sorts of different directions, along its outer edges. So in one place the wind may be blowing from the east in the morning, a few hours later in the same place from the south (the whirlwind has moved along) and again an hour or so later from the west. For so many reasons that we will not stop to explain, these big storms in this part of the country, nearly always move to the east or northeast. Now, can you tell why a west wind generally means clearing weather?

What Makes It Rain?

Did you ever take a sponge and let it soak up water? Of course you have, and you have used that sponge to wash your slate and for other purposes, and you know that even when it feels almost dry, if you squeeze it, some water will come out. Pressure does this because it forces the particles of the sponge together, and there is not room for the water. The air is something like a sponge and it generally contains a good deal of water. If we could only imagine something squeezing miles and miles of the air, the water would be forced out just as it is from the sponge when it is pressed. Perhaps you know that when anything loses heat, its particles tend to come closer together. This is true of air as of everything else. So, if warm winds have come in from off the ocean, or lakes, where they have soaked up a good deal of water, and if for any reason they lose their heat, say they come in contact with high mountains or colder air, the loss of heat acts just the same as pressure, perhaps extending over thousands of miles of surface, and the particles of air draw closer together and the water has to fall as rain, or perhaps snow. Look at your geography. If the Rocky Mountains, instead of being where they are, extended north and south from eastern Montana to Texas, do you think there would be more rain in Utah and Nevada?

Why Do People Get Hungry?

It will help us to answer this question if we compare the body to a wonderfully organized and effective factory, whose product should be a life of usefulness and honor. As in all factories, there are many different departments, and much complicated machinery, all having a part to do in the final result. But these machines (organs of the body) can no more work of themselves, than an automobile can run unless you supply it with gasoline or electricity. So the body has to be furnished with supplies of food, raw material from which is derived the energy or force to run the machines, as well as new parts to replace the worn-out elements in the machines and factory building.

All wants of whatever kind have to be reported to the brain, which may be called the telephone exchange of the factory in touch with all departments. Some organ has to do the reporting. In the case of hunger, the digestive machinery in general, being that part of the factory having to prepare the raw material fed in for the use of the other machines, seems to know the needs of the body in this respect and reports them to the brain as the sensation that we call hunger. We have no doubt as to what is wanted, and in due time we furnish the stomach with a new supply of raw material. The regular meals that we eat each day may be compared to a sort of standing order to be filled daily.

Perhaps we have worked hard some days and need a larger supply of food. We say our appetite is good. Some days we are ill and nature makes all the machines run on supplies stored up in the various tissues for just such an emergency, and the stomach countermands its daily order (our appetite is poor and we can not eat). Afterwards, when once more well, the stomach calls for its regular supply, also for what is needed to fill up the reserves (our appetite is unusually good). In this country, most people can obtain sufficient food to at least supply the demand, but not always, in which case the body suffers, and such a party can not do his best work. If supplies are very deficient, or cut off altogether, the calls from the stomach become very urgent, and people will do almost anything to get food, even to robbery and stealing. So hunger is a general need of the body gathered in one whole by the digestive system, reported to the brain and easily understood by every individual. Do you now see why children generally have such good appetites?

Why Can We Wash Better in Water From a Cistern Than That From a Well?

The water from a cistern is called soft water, because it is rain water that has not soaked through the ground, like water in a well. Sugar and salt are not the only things that water can dissolve. It soaks up air and so always has more or less of a gas in it (carbonic acid gas) that helps it to dissolve a great many substances. If it passes over limestone rocks, it is sure to dissolve and carry away a little lime, or it may hold in solution some alum, iron or sulphur. Deposits of these materials, and others, are quite common in the ground, perhaps in such small quantities that we would not notice them, but the water that falls as rain, soaking through the ground, comes in contact with them and dissolves some of them and becomes what we call hard water. Well, you know you use soap in washing. Soap will not make a good suds with water containing such materials. Can you now see why the water in some wells and springs tastes so different from that in others, perhaps not very far away? Do you know of any sulphur springs? Did you ever read about salt springs? Do you know why doctors advise some people to drink water from some medical springs?

Why Are Eggs of Different Color?

If you live in the country, you know about the color of different eggs. You know the chickens always lay white or buff colored eggs, while turkey eggs are speckled and the robin's blue in color. You have probably seen colored plates showing different eggs. Perhaps you have noticed the picture of the eggs of some birds that live on sandy beaches, like the sandpiper; if you try to tell how they look, you say they are pretty much the same in color as some of the pebbles lying near them on the sand. Mother Nature always has some good reason for what she does and the color of bird's eggs is no exception. When you think about it, you know eggs must be left undisturbed so that the mother bird can hatch out her young. Nature often colors up the shells of the eggs to agree with the surroundings of the nest so they will not be readily noticed by animals or men and boys hunting for them. The sandpiper's eggs look something like the pebbles on the beach. The robin's nest in the apple tree surrounded by green leaves with the blue sky above, and the blue eggs are not as noticeable as they would be if they were white. The turkey prefers to hide her nest in bushes and out in the woods and her eggs are covered with brown spots. Hen's eggs are different. Nature intends us to find them readily, perhaps that is one reason why they are left staring white or a buff color.

Why Are Eggs Different in Shape?

Did you ever find a screech owl's nest in a hollow tree? If you did, you know

the eggs are almost round like big marbles. But most eggs are oblong, with one end considerably larger and more blunt than the other, such as hens' eggs. Then there are eggs varying between these extremes. Here again, if we question nature, we find that she has a reason. The screech owl's nest is in a hollow tree. There is no danger of the wind blowing the eggs out of the nest, they are left round. Most birds, however, build their nests in exposed places where the eggs might be blown out, and those found in such nests are generally of the more usual type, so that when the wind hits them they turn in a circle but still stay in the nest. We should learn from these questions that there is nothing small and common-place for which a good reason cannot be found. Question nature carefully and you will generally find an answer, though we will never exhaust all of her secrets.

What Makes Ice Float?

You know the direct answer to this question at once, because it is lighter than water. The real question you want to ask is how comes it that ice is lighter or less dense than water, when cold contracts, solidifies and thus generally speaking makes more dense? This brings us to a very strange property of water and one most fortunate for human welfare, seemingly in accordance with a general design on the part of nature to accomplish wise ends. Cooling water does indeed contract, though very slowly, until near the freezing point, then it expands also at a very slow rate until the freezing point is reached; but in the act of freezing, it expands a little so that ice is not quite as dense as water, consequently it will float.

To be exact, we might say that water in freezing expands by about one-eleventh of its volume. Many very important results follow from this curious property of water that we will tell you about and you will see how wisely nature manages things. If it were not for this property, rivers, ponds and lakes would commence to freeze at the bottom instead of the top, and we would have lakes and rivers of immovable ice that the summer's sun never could melt. If it were not for it, snow falling on high lands and mountains, as in Greenland, would stay there forever; instead, however, owing to this peculiar property, it forms great fields of ice, which move like a river but very slowly, to the sea, and thus the water in the snow is returned to the ocean. This is vitally important for us. In fact if it were not for this unique property of water, we could not live on the earth. Now do you think this happened just by chance, or some fortunate variation of a general law, or is it the result of some intelligent force?

Why Are Leaves on Trees and Bushes Green?

We have told you how leaves act as lungs. Now, we will tell you how they act as stomach, or, in other words, how plants feed. You should understand, though, that a great deal of plant food comes from the ground, by way of the roots. The most important material of all, however, and the one most abundant, which builds up the body of the tree and constitutes the wood so that it burns readily, comes from the air by way of the leaves. A leaf that looks so thin is really a complicated thing. Between its two surfaces is a thin layer of cellular tissue; so called because it contains a great many little cells. These cells are full of very small grains that contain a chemical substance called chlorophyll. It is this green matter that gives color to the leaves.

Chlorophyll has the strange power, when acted on by light, of decomposing, or splitting apart carbonic acid gas that is always mixed with the air. So, when air enters the breathing pores of the leaf that we have told you about, the cells strain out, so to speak, that gas and split it apart, giving the carbon to the sap, which carries it away to build up the

"WHY ARE EGGS DIFFERENT IN SHAPE?"

tree. In this way, also, is derived some of the oxygen that plants need, though most of that is gained by the lung function, or work, of the leaf. We must

add, however, that these cells can only split up the gas and feed the tree or plant when acted upon by light; consequently, they cannot do this work at night, and trees and other plants then go to sleep, like most animals. Trees, of course, take a long rest when the leaves are off in winter. Now, can you tell why in a country like Alaska vegetation grows more rapidly during the short summer than, say, in the central part of the United States?

What Puts the Salt in the Seas?

The rivers all, sooner or later, pour their water into the sea, and carry with them vast quantities of solid matter and matter in solution. You know that water dissolves sugar if you put some in it. There are other things that water will dissolve and salt is one, consequently the rivers are carrying away salt all the time; because salt is very common in soil. It is, however, such a small amount in the river that you do not notice it. The waters of the seas are evaporated by the sun, but none of the salt is taken up into the clouds. The water, then, that returns to the earth in rain has no salt; but by the time it reaches the sea again, after soaking through the soil and flowing down the rivers, it has another load. Consequently, the oceans are receiving salt all the time, but never giving up any of it, and so the ocean water must get more and more salty as time passes. Do you know of any small bodies of water that have no outlet and so the waters have become very salty, in fact almost brine? Do you know of such a body of water in the United States? Why does Lake Michigan remain fresh?

Why Do We Have Lines on Our Hands?

It is claimed by many that the use of these lines is to help the sense of touch in our hands and fingers. By making little valleys and ridges the lines increase the surface of the skin, and by going in different directions they help us to feel the kind of surface peculiar to an object that we touch. The little endings of the nerves of touch are placed to the greatest advantage by means of these lines. That seems to be the reason why they are so very well marked on just those parts of the skin where delicacy of touch is most important.

Perhaps you know that some people think they can tell your past life from these lines, and also tell you what your future is to be. It is true that the lines on no two hands are just the same, but all you can possibly decide from that is that since they probably have something to do with the sense of touch, and people differ among themselves in that respect, which difference may possibly show in the lines. Look at the lines in your own hands, compare them with other hands. Do you think that the lines on a blind man's hand, in general, are apt to be more prominent than those in the hands of people that can see?

What Makes a Rainbow?

You know what glass prisms are and you have doubtless played with them and noticed the different colored bands of light seen near them when the sunlight falls on them. The explanation is that a beam of sunlight is not a simple thing, light a straight piece of paper, but it is a cord, so to speak, formed of many different colored waves (or we had better say waves that cause different colors) bound together, as a cord is composed of many twisted threads. This gives you the idea that we want you to form, but, of course, nothing is actually twisted in the sunbeam. Now a prism has the power of separating these different waves (something like untwisting the cord) and spreading them out so that we see the different colors which they make, as violet, yellow, or red bands of light.

Little drops of rain have the same power; so if the sun be shining while the rain is falling, and we happen to be in just the right place, we can see the bow of beautiful colors against the back-

"WHAT MAKES A RAINBOW?"

ground of sky or cloud. The sun beams striking the drops of falling water have been split apart, bent and sent back to us, and the combined effect of all these little drops is the beautifully colored rainbow. Did you ever see a rainbow at night? Where did the light come from that made it? Be careful in your answer or you will not get it right.

What Makes an Echo?

After the lightning flash you have heard the thunder come rolling in, now

it has almost died away, then it sounds loud and clear. The flash was but a moment in duration. Why does the sound strike the ear in this way? Perhaps you live in a hilly country, and know some places where if you shout the sound comes back to you a moment later. Both of these instances are examples of échoes and you wonder what occasions them. Recall the bounding ball, also the explanation of seeing yourself in a glass. An echo is to be explained along the same line.

Sound is caused by air waves, or vibrations striking the ear. They bounce off of surfaces on which they strike (they are reflected) in just the same way as light vibrations are reflected from a mirror; and if we are standing in just the right place, we hear not only the original vibrations that produced the sound first heard, but also the vibrations that have been thrown back. As in the case of light, it makes no difference how broken, curved, or bent the course the waves have taken, if they reach the ear we hear the sound. A great many surfaces may reflect sound. It may be reflected from clouds. It is this that adds to the rolling sound of thunder. It may be reflected from the surface of water, or from the sides of hills. Do you know of any echo near your home? Did you ever notice it in buildings? Can you not now explain why you can hear public speakers better in some halls and churches than in others?

Why Do Things Change Color?

You know that colored ribbons or cloth do not always look the same in gaslight as in daytime; and we are sure you have watched the changing color of clouds when the sun is setting; and, yet again, you have looked through colored glass and discovered everything looked red, or blue, or whatever was the color of the glass. The real explanation is that color is not something in the object itself but depends upon the color of the light that, coming from the object, whatever it may be, finally reaches the eye. When we see things, such as ribbons, cloth, grass, etc., in the daytime, the light is generally sunlight.

Do you remember about the rainbow? A ray of sunlight, you recall, is not a simple thing but (just to help us understand it) a twisted cord (so to speak) of different colored waves, or we had better say different vibrations that make different colors. Now, the light that substances allow to reach the eye, coming from or through them, is not the same in all cases as the ray which originally fell on them, because you see, for some reason we do not understand, the reflecting substance sifts out some of the different waves twisted in the sunbeam. If a substance allows all the vibrations to pass to the eye, it is white in color; if only the red vibrations, it is red; if it sifts out all, it is black. But when we see things at night by artificial light, which is quite different from sunlight, the light that reaches the eye from it may be quite different. Of course, when you are looking through colored glass, it is the glass itself that sifts out the colored vibrations from the light that is coming from an object; it stops all vibrations except those of its own color. Thus the color of an object, in every case, depends on the color of the light that, coming from the object, meets the eye.

Do you know there is another sense in which this is true? Some days everything seems to be going wrong, we are unhappy, nothing is right, everything is sad. The next day, perhaps, everything is all right, we are happy, things look bright. The first day, you had as we say the "blues." Often everything was just the same both days. The difference was in your own mind. Now which condition had you better cultivate?

Why Does a Gas Mantle Give a White Light?

In a burner where a gas mantle is used, air is always fed in. We are sure you know why that flame is nearly colorless, but very hot. This heats a white mantle of gauze made of oxides of two rare

metals, thorium and cerium, that have taken up all the oxygen they can and consequently will not burn even when subject to considerable heat. The blue flame furnishes sufficient heat to make the mantle glowing hot, and what we see are the white hot particles of the mantle.

Why Are Some Flames Yellow and Some Blue?

The color of a flame depends to a large extent on the substance that it is burning, as you know from the colored flames in fireworks. The yellow flame from an ordinary gas burner, or a kerosene lamp or candle, is made up of particles of glowing carbon that have not been completely burned. In a gas stove, air is drawn in from below and mixed with the gas before combustion. On account of this extra supply of air, all the particles of carbon are completely burned, and a blue flame results, which gives much less light but more heat.

You probably have noticed a delicately blue flame playing over a hot bed of glowing coal. This is different from the blue gas flame just mentioned. In this case, the air coming up from below through the hot coal does not find enough carbon to unite with its oxygen, and so it takes on a little more when it comes into the air. Now, we are sure you can tell why the center of a gas flame is blue and the rest of it is yellow.

What Are Weeds Good For?

Boys are apt to think that on account of weeds they have to work in the garden when they want to play ball. But Mother Nature has some good end in view. Many worms and insects that seem useless to us are, after all, necessary to the fertility of our soil and the life of plants and fruits. What is a weed? Let us give you one answer. A weed is a plant out of place or one that we have not sufficiently studied and so are ignorant of its good features. Do you know that wheat and corn and—well, all useful plants—were once weeds? Only when man studied them and found out how valuable they were, and commenced to educate them did they cease being weeds. When we say they educated them, we mean cultivated them, which brings out good qualities in plants as well as boys and girls.

Do you see the wild daisies in the meadow? They are weeds there; but Mr. Burbank in California has educated them until they are magnificent great flowers. The morning glory in the field is a weed, but trained around your porch, it greets you to a perfumed and decorated room in the morning. The wild potato is an almost poisonous, tuber-growing weed; what would we do without the cultivated (educated) plant we have made of it? There is no telling how many jewels in the rough Mother Nature has for us in what are now unsightly weeds.

Why Do People Laugh?

You may not know it, but this is a very hard question to answer. You, of course, laugh when you are pleased; but, then, you also laugh when you are tickled. You may laugh at another to show your contempt for him, you may laugh when your heart is full of hateful thoughts, and you know some people laugh much more than others. When you think about all this, you wonder why you laugh at all. You know that there is a very intimate relation between the body and states of the mind. The general appearance and actions of a person indicate to a considerable extent his mental make up.

All emotions, fear, anger, love, hate, joy, etc., show themselves in bodily appearance and actions. But the glory and honor of man is the possession of reasoning power. Emotion and reason are, to an extent, opposed to each other. We had better put it this way: emotions, like fire, are good servants, we could not well get along without them, but they are bad masters, and if you desire to be a strong intellectual man or woman you must keep your emotions under control,

but that does not mean that you must repress them all. Now, there must be some reason why man, the only reasoning animal, is also the only one that laughs.

Laughter, as you know, varies from a slight smile, through silent laughter, to boisterous guffaws. Muscles of the face, throat, indeed, all over the body are suddenly active. All the numerous emotions that lead to laughter (and joy, happiness, satisfaction, and so on, are only a few) need to be controlled as well as others, and so all these various muscles are set to work; this uses up a good deal of the energy in the body that was feeding the emotions, cools us off, as it were, and in a way rouses the brain to control. So, you may say that laughter is one of nature's methods of holding the emotions in check and setting the energy going to waste in the emotions at more useful work. You know a person who is very angry is in danger of doing all sorts of foolish things; if something suddenly makes him laugh, the anger is dissipated and he is not going to do any foolish thing. We are sure you understand what has happened.

Why Do We Cry When Very Sad?

Sadness is an emotion such as those about which we have just been talking. We cannot, of course, help feeling sad on many occasions; it is right that we should. Still the fact remains that sadness is a depressing emotion; that is to say, it tends to slow down all the processes of life. No one can do his best work when sad. Excessive grief really acts as a poison. Tears is one of nature's ways of counteracting some of the injurious effects from such a cause. In their secretion some of the poison of grief is eliminated. As people get older and more mature, therefore better able to control their emotions, they generally cease crying except on rare occasions. Just why tears should act as a sort of safety valve on grief, we cannot tell; but the fact is nature sets the tear glands at work when we feel very sad.

In the case of little children almost any trifling occasion suffices, and the injurious secretions of grief are some way alleviated by the flow of tears. Now you see why children cry very freely, their little bodies need all the energy they have just to grow; also why grown up folks when weakened by sickness or other cause are more apt to cry. Nature is helping to overcome the bad, depressing, poisonous effects of grief. Do you know that sometimes people experience such deep grief that they are in danger of going insane? If in such a case as that, nature suddenly comes to their relief by giving them a good, hard crying spell, the danger has largely passed. Laughing and crying both illustrate the efficient means nature takes to guard the health and sanity of the body.

Why Are Some People Right and Some Left Handed?

You probably write and make figures with your right hand, and there are many other movements you can do better with that hand than with your left one, though some of your friends may prefer to use the left. If you observe, you notice that the majority of people are right-handed. You wonder why this is so. We must understand that it is not simply a habit we have formed, for people all over the world are the same in this matter, and as far as we can tell from old pictures and paintings they always have been that way. If we only question nature closely in this and other matters, we are sure to come upon some simple, and on the whole reasonable, explanation that helps us to understand, if it does not settle everything.

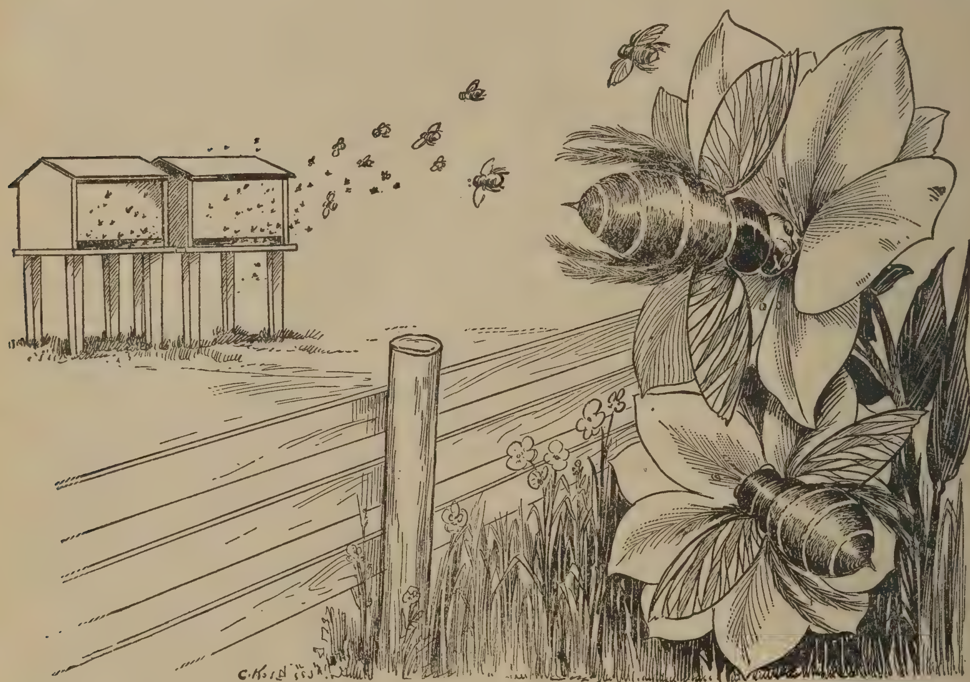
In this case, the explanation is about as follows: Just as we have two eyes, two ears, two hands, etc., we also have two brains, one on each side of the head, each in a general way attending to one side of the body. Of course, they work together, yet it is true that the left brain attends to the right side of the body, while the right brain attends to the left side. Now, there is a center in each

brain which attends to the memory of words and figures, talking and writing, but since we do not need each center to be active in this matter (really that might cause some confusion) the left speech center is far more active than the right one; just why nature should take the left center for this purpose, we cannot tell. Perhaps the right center is kept as a sort of duplicate engine to be brought into use if something happens to the first one.

Did you ever think that in talking and conveying thought, generally, the hands, arms, fingers, etc., are of great use in making gestures? You have seen deaf and dumb people talk that way. For some good reason, the centers of motion in the brain are closely connected with the speech centers, so what more natural if nature has seen fit to choose the left speech center as the one to put in more active work than that the right hand, being directed from the left brain, should be used by preference? But nature delights in variety, and so, now and then, the right brain is the more active one, the speech center on that side is the one used and thus becomes more developed, and the result is a left-handed person.

How Do Bees Make Honey?

What the bees gather from flowers of garden, orchard and field is really nectar, which they change into honey. Only a minute drop of nectar is secured from a flower, and in all its lifetime a single bee can gather only about half an ounce of honey. The bee takes the nectar into its mouth, where, by a wonderful arrangement of internal organs, it is partly changed into honey while the bee is on its way home. Once inside the hive, the bee inserts its head in a cell and unloads. Cells all around are being filled at the



"HOW DO BEES MAKE HONEY?"

same time. There is too much water in the crude honey, so a detachment of the busy workers make it their business to move their wings and thus evaporate the excess water. The contributions of many bees are required to fill a cell, but when it is ready it is covered with a capping of wax. If it is needed by the bees for immediate use, they do not take this trouble.

What Does a Queen Bee Do?

The queen is, first of all, the mother of the hive. It is her business to lay the eggs from which the little bees are hatched. She attends to this business with zeal and regularity. Were our hens to lay a small fraction of the number of eggs that the queen bee does, we would never go hungry, since the royal mother of the hive lays from two to three thousand eggs a day. She does not exactly rule the hive, but the bees know perfectly well her importance, so they wait on her and give her the very best food they can make. If anything happens to the queen, the alarm soon spreads throughout the hive. Some of the bees go rioting around, gorging themselves with honey. But martial law is soon declared and things settle down to wait the birth of a new queen, for which provisions are made.

It is the queen's business to be the leader of the swarms that from time to time buzz out from the old hive in search of new homes. They are so anxious to gather around the queen that the poor thing is nearly suffocated. In the meantime, the bees that stay at home in the old hive are busy crowning a new leader. One of the first duties of the new queen is to kill off all her rivals, for several princesses royal are waiting to succeed her.

Why Do Some People Have Blue Eyes and Some Brown?

In answering that question, we will tell you about the most wonderful, delicately decorated curtains in the world. One such is right in your eye but all eyes possess them. If you will look in another's eye, you will notice this colored curtain on the front of the eyeball. There is a little round hole in the center of it, and right back of that opening is a wonderful lens. As nature only wants light to strike the lens in one place, she places the curtain in front, with its circular hole in the center and she supplies it with extremely delicate little muscles that contract and expand and so make the opening larger or smaller to agree with the amount of light, for you know sometimes and in some places light is much stronger than usual.

That curtain is called the iris. It divides the space in front of the lens into two little chambers filled with transparent fluid. The body of the curtain is decorated by nature, that is to say she has arranged in it a great many pigment or paint cells that secrete or fill themselves with a colored substance. We must remember about these paint cells, because nature uses them in a great many other ways. In the back part of the iris proper there are nothing but dark, slaty blue pigment cells. If the paint cells in the front part of the curtain be scanty or not filled with pigment the eyes will be blue; but the front cells are generally supplied with paint and the result is various shades of color, that may be strong enough to cut off the dark blue color, and the result is various shades of dark, brown or black eyes. We do not know all, or even near all, of nature's secrets, but we may be sure that the color supplied to the iris serves a good purpose. Perhaps by a little thinking, you can begin to understand why nearly all dark colored races, natives of warm countires, have dark colored eyes.

How Long a Time Is "Quick as a Wink"?

You know it is a very short time because if you wish you can wink very fast. The time required in making the different movements of a wink has been measured, and it is found that the aver-

age time for the descent of the lid is from seventy-five to ninety-one thousandths of a second. The interval while the eye is shut was in one case only fifteen hundredths of a second. The raising of the lid occupied seventeen hundredths of a second. A specially arranged photographic apparatus was used. So the popular saying that something is done "quicker than a wink" means a time that may be stated in fractions of a second.

Why Do We Tan When Exposed to the Sun?

As soon as we expose our bodies to sunlight the skin becomes tanned, that of brunettes taking on a bronze color, that of blond persons becoming dark yellow. What has happened? In order that the scorching rays may not penetrate the delicate tissues under the skin and injure them, nature begins at once to pack the pigment cells that are thickly placed in the inner layers of the skin with colored substances to keep back rays of light that act on the tissues. From all parts, flow coloring matters; first, the yellow pigment from the fat cells; then, black pigment formed from the blood by a gland in the kidneys, called the suprarenal. These glands have a great influence on our health, and when they are excited to supply this coloring matter that influence is intensified and they invigorate the system. This probably explains why sun baths are so powerful a tonic; but if this be true, notice this curious result—a sun bath is beneficial, not directly, but because an important gland in the body gets to work in earnest to overcome the irritating action of sunlight.

What Are Freckles?

Some parts of the sun's rays have a tendency to irritate the inner tissues of the skin. Nature shuts them off from a great many people, especially those native to warm sections, by giving such people a dark colored skin, that is to say packing the pigment cells with black paint. Some think that in addition to cutting off the active rays of the sun directly, the pigment exerts a sort of counter influence which neutralizes the irritating action. Generally most of us have enough pigment to serve our purpose unless we deliberately expose ourselves to sunlight. Some children, however, especially those naturally fair in color, do not seem to have quite enough color matter in their pigment cells, and freckles is one way nature has of remedying such a condition. Thus we see freckles constitute a protective measure, just as tan; only freckles are not uniform like tan, the pigment gathers in little patches from a pinhead in size to blotches perhaps as big as a split pea, and this condition tends to remain while tan will disappear.

Why Do We Shiver When We Are Very Cold?

There are more good reasons than one why we shiver when we are cold. In the first place, we may say that cold when first felt excites and disturbs the nervous system, just as heat usually soothes it. One good reason for shivering is that it makes us aware of cold as we might not otherwise be, and so we can protect ourselves. After the first stage of its action, great cold sends the brain to sleep. Shivering perhaps serves to keep the brain awake and make it aware that something must be done.

Still, when we question nature, we generally find she has some good, practical end in view, and this is the case with shivering. Whenever a muscle works heat is produced; indeed, a very great part of the heat of the body is made in the muscles, which have been called "the fireplaces of the body." Shivering consists of small, quick, to-and-fro movements of most or all of the muscles of the body, sometimes quite regular, as when our teeth chatter. Now, all thesee muscular movements are producing heat. So we may say that when a person, by keeping still, refuses to work his muscles so as to keep warm,

the brain takes the matter into its own hands and does what little it can by setting the muscles shivering.

Where Does the Snail Find Its Shell?

The snail makes its shell from its own skin. The same is true of the shell of the oyster, or that of the lobster. Our

"WHERE DOES THE SNAIL FIND ITS SHELL?"

own skin, we know, can make things which are fairly hard, such as our nails; and it is also true that the hardest things in our bodies, our teeth, which are, or should be, even harder than the shell of the snail, are really made from our skin, which has been, so to speak, turned into our mouths so as to line them. There are really few things more wonderful than the way in which soft, living creatures, mostly composed of water, are able to make the hardest things, like teeth, and shells, and pearls and so on. If we look very carefully at the skin of creatures like the snail, we can see how its outside cells are formed harder and harder, until they cannot be called skin at all, but are really nothing else than shell. We can watch very much the same thing if we look at the cells at the base of our nails or the cells that make the horns of animals, and notice how the soft skin is gradually changed.

Why Do Some People Have Black Hair and Some Lighter Colors?

Did you know that a hair is hollow? It is not like a blade of grass but more like a wheat straw, on a very small scale. The central shaft, however, is often filled with a substance called the medulla. The outer wall of the hair is composed of several layers, and in one of them, known as the fibrous layer, are located a great many pigment cells, just as in the iris curtain of the eye, and in the skin, and the color of the hair depends on the color of the pigment that nature uses. In a general way, this is the same color in any one individual throughout. That is to say, dark skin, dark eyes and dark hair go together; also blue eyes, light hair and blond skin. In one way or another, the prevailing pigment has some relation to the intensity of the sunlight; the first set of colors belonging quite generally to races native to the warm sections of the earth, the other set characterizing the natives of more Northern sections. By migration and inter-marriage, we have all degrees of these colors.

Why Do We Dream?

The brain has many parts and some part of it may be asleep while another part is awake and active. The fact is the entire brain cannot go to sleep at the same time or we would not be alive. When we dream most of the brain, especially the highest part, is asleep, but some centers are awake, and these, unguided by the higher powers of the mind, work on the materials of past experi-

ence, especially recent happenings. Perhaps only the very deepest sleep is entirely free from dreams, and it seems certain that most of us have dreams of which we remember nothing when we wake.

The more vague and shadowy and the more easily forgotten a dream is the fewer are the parts of the brain then awake; but when we have long and complete dreams, very clear and very clearly remembered, it is probable that higher centers of the brain are then awake. The fewer dreams we have, the better it is, for that means that our sleep is then more complete; and if we are to have dreams, it is best to have the kind that are scarcely remembered. But there is a great deal about dreams and the brain of which the wisest of us are ignorant. We know when the sun goes down, we can see stars invisible while the sun was shining. Now it may be when the glare of the higher centers of the brain dies down, powers that we do not generally know of come into play, and scholars think dreams sometimes are more significant than at others.

Why Does a Crust Generally Form in a Tea-Kettle That Has Been Used for Some Time?

Did you ever boil maple sap to make sugar? You know the sugar is left behind as the water in the sap boils away. It is the same with hard water in a teakettle. The water part is sent away as steam, the impurities remain and deposit themselves as a chalky crust, mostly lime, for that is the most common. Now you see why railroads are anxious to get as pure water as possible to use in the boilers of their locomotives, also why boilers in big factory engines occasionally have to be cleaned. Did you ever read of thick layers of salt in the ground? Does this explanation help you to understand how they got there?

Why Do We Perspire?

The surface of the skin is full of little openings, called pores. They are most numerous in the palms of the hand and soles of the feet, but they are general over the body. In all, they number a great many thousand. Each is the opening to a wonderful little gland that secretes or separates out from the blood minute quantities of water loaded with gases, and passes it out to the surface of the body. That process is called perspiring. When the water reaches the surface of the skin, it evaporates and passes into the air and is absorbed by the clothing. Under ordinary circumstances, the air evaporates the perspiration as fast as it reaches the surface of the skin.

This operation is necessary for health. The body-factory must get rid of the water that has done its work, but in addition to this most necessary end, nature uses the perspiratory system to regulate, to a considerable degree, the surplus heat of the body. This illustrates the simple but effective means nature employs to accomplish necessary ends. It will not do to have the internal heat of the body-factory too great, or the machines will stop running; the party has a sun-stroke or suffers from heat exhaustion. You very often read about such cases, and there is real danger on very warm days. At such times, if we have to exert ourselves, nature sets these glands more actively at work; and the perspiration begins to pour out on the surface. In common language, we are sweating. This results in increased evaporation, which is a cooling process, and thus the temperature is reduced. See how simple, yet effective, is this process.

Why Do We Use Soap to Wash Our Hands?

Well, in the first place there is always a little oil on the cuticle of our hands, which is nature's way of keeping it in good condition; but the oil gathers minute specks of dirt from things we handle. Thus our hands become dirty, though we may think we have handled only clean things. Now remember, the dirt on our hands is mixed with the oil always present.

A collection of tiny drops of oil held in some other fluid is called an emulsion. Water alone will not form an emulsion with oil, because the two will not mix, so we cannot wash well with water alone. But when water has soap dissolved in it, it is able to make an emulsion with the oil on our hands or anything we are washing, and as an emulsion, the oil and with it the dirt is readily washed from our hands. Does this help you to understand why oiling your shoes tends to keep your feet dry?

What Makes It Thunder and Lighten?

You have noticed trolley cars hurrying along the street, and often where the trolley wheel runs against the wire you have seen very bright sparks flash out, and generally heard a crackling sound at the same time. What you saw and heard was baby thunder and lightning. You have heard it said that electricity is the force that is moving the trolley cars, and you know we do a great many other things with the aid of electricity. While no one knows just what electricity is, we do know that waves of it are coming from the sun all the time; in fact, sunlight itself is only a form of electricity. So the earth and the air around it are constantly charged with electricity in somewhat the same way as trolley wires.

In summer more frequently than in other seasons, volumes of heated air conduct electricity from the earth to the clouds, and as this charge (volume of electricity) is not the same for all clouds, some clouds have a good deal more electricity than others, or the surface of the earth beneath them, and a very large spark suddenly passes from one cloud to another, or from a cloud to the earth, or just the reverse, to make the charges equal, and we say "it lightens." The passage of that spark causes such a disturbance in the air that the air waves strike the ear and we hear thunder. But it is only now and then, more frequently in summer, or at least when the weather is quite warm, that conditions are just right for such storms.

Why Do We Have So Many Different Languages?

At first thought, it would seem since people everywhere are on the whole much the same, for instance all having two hands, two eyes and so on, they ought to be able to talk to each other in the same language. Language, however, is not something that is born with a person, like curly hair, fair skin, or blue eyes. All such things we inherit, as we say, from our parents. But language is different. Each little baby has to learn the language which he speaks, and he can learn one about as easily as another.

If you could imagine a number of babies living on an island without any grown people to take care of them or teach them, they would invent a language of their own as they grow up; and if there were a number of such islands, separated from each other so the children could not go back and forth, there would be formed on each island a different language, which languages would at first be very crude, but as time passed they would improve.

Something somewhat similar happened in the long ago when men began to live on the earth, before they had any books or papers, or knew about the great earth on which they lived, or about each other. Tribes of men moved away from the old home, forgot their old kindred and, never hearing from them, in a few years forgot much of the old language, and had to invent new ones that while similar differed from each other.

We can see how in the course of time there would be formed great families of language; all somewhat alike, yet all different. This is what hapened in Europe and other places. All the languages in Europe form one great family, yet they have become so changed that the various people cannot talk with each other. This is not a full answer to your question, but it helps you to understand it.

"EACH ONE HURRIES AS FAST AS IT CAN TO SOME PLACE OF SHELTER"

Do Animals Talk?

Well not the way we do, for man has developed language, different classes of words, arranged them in sentences and so on. But Mother Nature provides animals with what we call instinctive calls and notes that certainly convey information from one to the other. Just let the old rooster in the barnyard catch sight of a hawk flying high up in the air and give his warning k-r-r-r-k; the hens and chickens in the yard do not hesitate or question a single minute. Each one hur-

ries as fast as it can to some place of shelter. So of all other animals, each one knows perfectly well what their various calls mean. Notice the dog asleep on the porch. He is having a nice little nap, but suddenly he hears the excited yelp of another dog near; he is off like a flash. That peculiar bark has told him something. The next time you go to the Zoo, take a look at the baboons. In their wild state, they travel around in droves, and keep up a constant chatter, unless they have some reason for keeping still. It sounds exactly as if they were talking to each other. Are you sure they are not? Scholars have tried to catch on a phonograph cylinder the chatter of monkeys and then study the records to see if they could make out words. One man thought he knew a number of their words, but if so, monkeys are certainly bashful when spoken to in their language, since they refused to talk back to him.

Why Do We Have Winter and Summer?

We have already explained that the temperature of the air depends upon the sunbeams that are thrown back into the air (reflected) after striking the earth. Now you can all see that where the sun shines directly upon the surface of the earth more sunshine is going to be sent back into the air than in places where the sun only strikes a glancing blow, so to speak. Suppose you threw a ball directly against a brick wall in front of you, it comes bounding back into your face; but if you throw it off to one side it goes away off the line of its flight, forming a large letter V, as it were. Now, remember that heat rays bound (are reflected) according to the same law.

Where we live on the earth, rays of sunlight do not strike it directly, you know, because at noon the sun is a considerable distance south. But our position in regard to the sun is not the same throughout the year. In the winter time the sun is a good deal farther south than in the summer time, so that, where we are living, considerable less heat is reflected into the air during winter than in summer. You know that where we live the sun is farthest south in December. Then the course of his travels brings him a little farther north every day, until in June, when he turns south again. And now we are sure you know why we have warmer weather in summer than in winter.

What month is it when you read this answer? Should today, with you, receive more heat than yesterday? You must, of course, understand that this is what we call a general law. We have already told you of many other things which effect the temperature, and why some days are warmer than others. What we are talking about in this answer are the great seasonal changes of the year, not depending on local causes that change the temperature from day to day. Does this answer help you to understand why Tennessee has warmer winters than North Dakota?

Why Do We See Lightning Before We Hear Thunder?

Did you ever notice steam pouring from a steam whistle a long distance away, and a few seconds later heard the whistle? And you noticed that the outpouring of the steam ceased a few seconds before the sound of the whistle ceased? That helps us to understand this question.

A crash of thunder starts at the very same instant as the flash, but light travels so much faster than sound that we see the flash before we hear the thunder. Sound travels through the air at a rate of about eleven hundred feet a second. That is fast, but light travels a great many times faster; consequently, we see the lightning before we hear the thunder.

The next time you are in a thunderstorm, if you will take out your watch and count the number of seconds that pass from the instant you see a flash of lightning till you hear the crash of thun-

der, you can tell very nearly how far away the lightning stroke occurred. It is only necessary to multiply the number of seconds by eleven hundred; the result is the approximate distance in feet. Were you ever near a tree or a house when the lightning struck it? You saw the flash and heard the thunder at the same time?

What Makes the Dew?

We must recall what we had to say about the air acting like a sponge and soaking up water, but giving it out again whenever, from any cause, it lost its heat; and in talking about clouds we spoke about the fine mist forming when the air began to lose its heat. Dew can be explained in the same way. When the sun sets the air begins to lose heat, because there is no sunlight sent back into it from the surface of the earth, and so, of course, it tends to lose some of the water that it contained. At such times, the wonderfully small drops of water tend to gather on the points of blades of grass, leaves, growing grain, or other forms of vegetation, and we say "the dew is falling."

Perhaps, to make this clear, we should tell you that vegetation, growing grass, grain, etc., ending in points radiate or lose heat more rapidly than the level surface, and so the dew condenses, or gathers as drops of water, on these points. You now understand that dew is tiny globules of water squeezed out of the air that instead of rising and floating away as clouds, settles gently back to the earth. Do you now see why on windy nights the dew does not form?

What Makes the Sun So Bright and Hot?

You know that the sun is enormously large and that our earth is very small in comparison. But the sun is not near so condensed, that is, compact, or solid, as the earth. In fact, the sun is an immense ball of gas, but gas under enormous pressure. Still, if it were to become a solid body, or a large part of it became solid, it would be a great deal smaller than it is now. There is a force tending to produce such a result. It is the same force that holds you and everything else on the surface of the earth. It has a long name—Attraction of Gravitation.

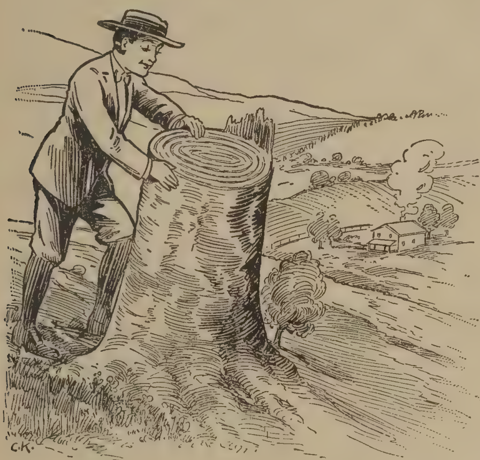
While we do not know what it is, we do know that it is by reason of such a force that all particles of matter tend to approach each other. The sun is so large that its attractive force is very great, being strong enough to hold our earth and all the planets in their proper places. On the surface of the sun it is enormous. Heat is the force in the sun that resists the action of gravitation, but from minute to minute, day by day, without ceasing, the sun is radiating (sending out) immense volumes of heat in every direction.

This loss is evened up by the action of gravitation, which pulls the particles in the sun closer as fast as the loss of heat will permit. The particles on the surface, under the influence of gravity, are really falling towards the center of the sun, and a falling body whenever it stops gives out heat. It is true the particles in the course of a full year fall only a short distance, but there is such an unthinkable number of them and their total weight is such an enormous amount that a vast quantity of heat is set free. It is estimated that if the sun shrinks only 250 feet a year that amount of motion will supply all the heat radiated during the year.

How Can You Tell the Age of a Tree?

We are learning that a tree has many things about it that remind us of animals. It breathes, feeds, sleeps, and its sap reminds us of the blood in animals. But animals grow from within. Probably all the trees that you are acquainted with grow by adding circular layers of material to their trunks and main branches. But there is a resting time of some months when most of our trees have no leaves, and each of these layers is quite distinct from the others. You

can then tell roughly the age of a tree by the number of rings shown in a cross section of its trunk. Look at the next tree stump you come upon and notice these rings. Since the main branches are often nearly as old as the trunk, the



"THE AGE CAN BE DETERMINED BY THE NUMBER OF RINGS"

approximate age can be determined by the number of rings shown in a cross section of a main branch. In trees like the pine, the age can also be found by counting the tiers of branches along the trunk, for one of these grows out each year.

How Long Do Trees Live?

Trees, like animals and all living things, pass through a life cycle, that is to say, a series of regular changes. They are born (sprout from the seed) ; during some years they grow (like young animals) ; then, when they have reached their growth, old age comes on and they die. Some trees may go through these changes much more rapidly than others. Hardwood trees generally grow more slowly and live longer than those whose wood is soft. Trees that have stood for centuries are not uncommon. There is a tree still standing in Maryland that two hundred and fifty years ago was a large, handsome tree, and a treaty with the Indians was made under its branches. But all other trees are young in comparison with some of the monster big trees of California, which were just in the prime of their life when the Christian Era began, and that, you know, was more than nineteen hundred years ago. They are probably the oldest living things in the world.

You and the little tree in the yard both increase in size from year to year, but mention some respects in which your increase differs from that of the tree.

Why Does a Pitcher of Ice Water "Sweat"?

You know that if you place a pitcher of ice water on a stand, on a hot day, probably, soon afterwards, you find the outside of the pitcher covered with drops of water. Where do they come from? They have not come through the sides of the pitcher, because some days the pitcher sweats much more than others, while on cold days, as in winter, nothing of the kind will be noticed. The drops must come out the air in some way. Now, if you will recall what makes it rain, you will understand at once why the pitcher sweats. The surface of the pitcher is much colder than the air, so the air gives up some of its heat. But that means its particles come closer together and the water in the air is simply pressed out.

Do you think that the drops on the outside of the pitcher are formed at all like the drops of perspiration on your face when you move freely on hot days? Think before you answer this question. Are they in any ways like drops of dew? Were you ever in an ice factory? Did you notice the ammonia pipes all covered with frost? Does the answer to this question in any way help you to understand how that frost is formed?

Why Does a Ball Bounce?

In the first place, a rubber ball is not the only kind of a ball that will bounce. If you have a glass marble in your

pocket, which is a little glass ball, drop it on the sidewalk and see it bounce back. Now, anything that bounces does so because it is elastic; when we say a thing is elastic, we mean that after something has put it out of shape, it will return to its shape. Generally, we do not use this word quite right. We only think a thing is elastic when, like a piece of rubber, it can be very easily made to change its shape, and then go back again. But the amount of force that is required to make a thing change its shape is not the point, but it is whether it will go back to its former shape, and how perfectly it does so. The most elastic thing is the thing that most perfectly returns to its shape.

A steel ball, then, is more elastic than an india-rubber ball. It is true, you can not squeeze the steel ball out of shape with your thumb. But the point is that the steel ball, when it is bounced, for instance, returns to its shape more perfectly than an india-rubber ball, and it is just because it does this that it bounces so well; for all bouncing depends on the ball being flattened a little when it strikes the wall or floor, and then, because it is elastic, springing back to its former shape.

Why Do We Put Yeast in Bread?

Did you ever eat any bread in the baking of which no yeast had been used? Such bread is called unleavened bread, and, since it is quite solid and hard to eat, you much prefer nice, light bread. Of course, you know what dough is. Now, yeast is mixed with the dough to leaven it, and one meaning of that word is to change or moderate. You further know that the yeast generally used comes in little compressed cakes; but perhaps you did not know that it consists mostly of an immense number of little plant seeds, or spores, which only need to be sown in fitting places to commence growing at a wonderfully rapid rate.

The warm, moist dough, which consists so largely of starch, is splendid soil for this purpose, and the spores at once begin to increase in number very rapidly. In some way this growth results in a number of chemical changes in the dough, all of which contribute to making good bread. One valuable result is that a gas (carbonic acid gas) is set free. This gas puffs up the dough or, as we say, makes it rise. When the bread is baked, the heat kills the little yeast cells and expels the gas; but the resulting bread is light and porous, not only easy to chew but pleasing to the taste, owing to the various products produced by the growth of the yeast. Do you now understand why yeast cakes should be kept in a dry, cool place?

Why Do We Yawn?

We have seen how necessary breathing is to life, and that if we are deprived of air for even a few minutes, we cease to live. But most of us do not breathe quite as much, or we had better say breathe as deeply, as we should. Some of us are careless in this respect, and only breathe a little ways into the lungs, when nature intends us to take deep respirations. For many reasons, we occasionally need an extra supply of air. Perhaps the air we are breathing is not quite as pure as it should be and we need more of it than usual. Perhaps we are tired and nature wants to invigorate the system.

As we are well, nature does not increase the number of respirations we are taking, but issues a command for an extra supply of air. We open the mouth, perhaps elevate the shoulders, or go through the motion of stretching, and all the time we are taking in a very full and deep breath, forcing an extra supply into the lungs. This is exactly what nature wants. It is not involuntary, that is to say if we think about it we can check it, but it is such an easy way of supplying a want of the body that we let nature have her own way; and we are so used to it that we do not notice it.

Many times we yawn because some one near us yawns. This is on the same principle that seeing food before us, we suddenly want to eat. We get into lazy habits of breathing. We really should

have more oxygen, but we do without it. The eyes seeing some one else taking on a fresh supply report the occurrence to the brain, which has its attention, so to speak, called to the need and on the spur of the moment sets the lungs to yawning. Did you ever notice your dog or cat stretch and yawn? Have you got a polly? Did you ever notice it yawn? Tell us why when you are sleepy but trying to keep awake, you begin to yawn?

Why Do We Sleep?

We have compared the body to a magnificent factory with complicated machinery, and the brain to the central telephone exchange in connection with all departments. The mind is the operator that nature has placed in charge of this central station; but just who or what this operator is, remains one of the greatest mysteries. But we know that it is necessary for it to retire, now and then, as far as possible from active control. At such times our waking operations and activities, our planning, figuring and calculating, our outward life in general, ceases and we "go to sleep."

Only necessary work, such work as does not require the decision of reason, continues. But just as in a factory when the daily operations are over, some workmen remain to do some delicate or important work, free from the bustle of day, so when this body-factory is quieted some of the processes of life are continued under more effective conditions. If you are ill, which means that something has gone wrong with some of the machines (some internal organs), then it is that nature seems to take advantage of the quiet and freedom from daily cares to advance the healing process (do the repair work) and in general to tone up the system (look the factory over and see that everything is in order). A good sleep is the best of medicine. Nature stills the waking activities of the factory, relieves the operator in charge of most of his duties so he will not "cut in" and interfere. This explanation is of course fanciful, but it will enable you to understand what sleep really is. It is a wonderful provision of nature to keep the body-factory in a state of high working efficiency. How much sleep do you allow yourself every night? It should be ample in amount and regular in time, and when going to sleep dismiss, as far as possible, your worries and anxieties and assist nature in her beneficent work.

Do Plants Sleep?

Certainly they do. What is the difference between animals and plants? It seems easy to answer that question, but if you try, you encounter all sorts of difficulties. They both go through a life cycle, infancy, growth, maturity, decrepitude, and death; there are father and mother plants as there are father and mother animals; both plants and animals have to breathe, and take nourishment from the air and their surroundings; they both have a circulatory system to carry nourishment to their different parts, and so, of course, plants, not less than animals, need periods of rest.

We have been comparing our bodies to a factory building filled with intricate machines. In a similar sense, we might say that the plants are smaller shops, plentifully supplied with machinery, presided over by (let us say) the forces of life. Life itself is too great a mystery for us to talk about, but when its forces are withdrawn, or cease to be active, the plants die. Well, these forces need time to keep the machines themselves in order. So the plants sleep. The old tree near your front door not only has had a good long sleep through winter, but every night his leaves stop eating and digesting, and the tree goes to sleep. So of all plants. Suppose you read once more why grass and leaves are green. Of course, grass and corn and growing plants keep on growing during the night, just the same as you do when you sleep.

What Makes Popcorn Pop?

Kernels of popcorn are filled with tightly packed starch grains. Each ker-

nel is divided into a large number of cells, each of which may be likened to a tin box, the walls whereof are sufficiently strong to withstand considerable pressure from within. Upon the application of heat, the moisture present in each little box is converted into steam that finally escapes by a little explosion. To obtain satisfactory "popping," there is required a high degree of heat. This causes the greater part of the cells to explode nearly at the same time, and the grains of corn really turn inside out, and are changed into relatively large pieces of snow-white starch.

If corn be old and dry it will not pop satisfactorily. A few cells near the center of the grain may burst but the general result will be unsatisfactory, there will be too many hard grains for you to bite. At the base of the kernels, where they come off the cob, the cells appear to be driest, and these cells are seldom burst in the popping. Does anything like this happen when you roast chestnuts? When you bake apples?

"WHAT MAKES POP CORN POP?"

What Makes a Pop Gun "Pop"?

Air as you know is very compressible. When the stopper is put in one end of the gun and we begin to press the piston down, the air is compressed and the more it is compressed the more it presses against the stopper, at length the pressure is too great, and the stopper is blown out. As it is released, the air naturally expands or spreads itself out again to fill the space it occupied before it was compressed. This means, of course, that it gives a quick push as it expands to the air on all sides of it, and so it starts the waves of air that spread out in all directions from the point where they started and reach our ears. The kind of waves which strike our ears produces the sensation of a very short, sharp sound. It is short because the cause of it acts for only a very short time, and the sound of it is best represented by the word "pop."

What Makes the Noise When a Firecracker Explodes?

This is on the same general principle as the noise of a pop gun. In the pop gun, it was the sudden release of air under pressure. In a fire cracker, some powder inclosed in a minute paper cylinder is burned and sets free a large amount of gas, much more than the tube can hold, and it presses against the wall and blows a hole through it. That sudden release acts just as it does in a popgun and a wave is started that strikes the ear as sound. Now you explain what makes the noise when an automobile tire blows out. What makes it when corn pops? You know heat expands air, what would happen if you were to take a piece of iron pipe, firmly close both ends, and lay the tube on a hot fire?

Why Do Burdock Burs Have Hooks?

Mother Nature employs all sorts of methods to spread abroad the seeds of plants. Plants cannot move about like animals, and so some means must be provided to scatter the seeds, and Mother Nature delights in variations in her modes of work. She seems to believe in trying all sorts of ways to accomplish her ends. Sometimes she packs the seeds in a juicy fruit like a strawberry, so that animals will eat them and thus carry the seeds away with them. Sometimes she arms the seeds with some device by which they stick to the fur of animals and your clothes so that you carry them away with you, probably not knowing that you have them until you have gone a mile or so, when you pick them off your clothes and throw them away.

You see we have answered your question already. The little hooks on the burs are so many little hands that reach out and catch hold of your clothes, or the hair of your dog, and so they are carried away. How many other kinds of seeds do you know that cling to your clothes? Do you know any seeds that Mother Nature furnishes with downy wings so that they go sailing off with the wind? How about the burs around a chestnut? Are they like the burdock burs? Be careful of your answer.

Why Does It Swell Around a Cut or Where a Sliver Penetrates the Skin?

To answer this question, we will have to tell you how nature guards the health of the body. When you cut your finger, or a sliver penetrates it, the knife or piece of glass, or whatever has caused the cut, or the sliver pushed into the skin, may carry with it some very small disease germs though you cannot see them unless you use a very strong magnifying glass. But nature seems to realize the danger, and apparently plans to overpower the germs at once, before they get scattered through the body; in addition, she seems to guard the cut or hole in the skin, so that no wandering germs can find their way into the body. So she hurries to the spot a little army of blood cells, on the same principle that the mayor of a city hurries a band of policemen to where danger threatens Thus the blood cells are hurried to where

the invasion has occurred, and they crowd so thick that the flesh swells around the cut to make room for them. All this makes heat, their crowding hurts us, and we say the place where we have been hurt is swollen and inflamed.

How Ants Keep Little Cows

You have read about ants and you know they do a great many very strange things. There are little animals called aphides, the more common name is plant lice, which are a great nuisance in the garden, but the cunning little ants keep them for their own use, somewhat on the same principal that we keep cows. Our cows feed on grass from the nourishment of which they furnish milk. The aphides feed on the sap and juice of plants, a part of which they turn into honey. Instinct taught this to the ants long ago, and as they like honey, they make slaves of the aphides, pen them up in pastures (on plants), or carry them away to barns and dairy houses (or ants' homes in little underground galleries).

Some ants are more cunning than others in this respect. The little brown ant climbs high plants and bushes to get at the lice. On coming to one, the ant gently caresses the body of the aphis, strokes it and taps it, and causes the aphis to part with its honey. (He is milking it.) The ant drinks the juice (milk), then passes on to another aphis and repeats the operation. The little yellow ant, though she looks so humble, is a lady of wealth and substance, part owner of flocks and herds of aphis cows that live upon the roots of grass, and she is not content to leave them in plant pastures, where they run the risk of being eaten by other insects.

The brown ants may mark off the aphides on certain bushes and plants as their own, and make tunnels in the plants and imprison the aphis cows in them, and fight other ants which go near them. (They have fenced off their pastures.) But the yellow ants do better than this. They take the aphides bodily and carry them into stables they have provided below the surface of the ground. How they manage to feed them we do not know. Perhaps they carry food to them as we feed penned up cows, perhaps they have to get their own food from roots growing down into their stables.

What Happens When One Faints?

Fainting illustrates the extraordinary care nature takes to guard the life of the body in case of sudden emergency. It is the brain that attends to every detail of life in the body. You may think that the heart beats because it is made that way. The fact is there is a little center in the brain that is constantly on guard in this matter. If anything happens to that center, the heart stops work at once. The brain, then, needs a large and regular amount of blood to supply it with energy. For many reasons, something may happen to diminish this needed supply. It may be some sudden shock, excessive joy or fear, or some defect in circulation.

Nature must at once and in every possible way correct this state of affairs. It may be a matter of life or death. She does not stand on ceremony, but at once cuts the telephone wires (the individual faints), so the poor, tired and endangered brain will not try to attend to business, and the body falls. This is what nature wants, for when you are standing or sitting your heart has to drive the blood upwards to your brain against the attraction of the whole earth, which tries to pull everything down. But directly the fainting person falls, the heart's task of sending sufficient blood to the brain is made easy, very soon his brain gets sufficient blood, and, generally, he is all right again. The crisis has passed. So you see that the falling is nature's method of "relieving the situation."

Now, do you help or hinder nature when you raise a person that has fallen in a faint? If you feel like raising something, why not raise the feet?

Why Do We Have Only Two Sets of Teeth?

Did you know there were some animals that could grow another limb in the place of one they had lost? But nothing of that kind occurs in the life history of higher animals. In the case of teeth, however, nature uses various plans. Some animals can grow as many sets of teeth as they may need. In the case of man, nature has settled on two sets, as the general rule. When we are born, we have hidden in our gums our first, our baby teeth. They are twenty in number and completely formed at birth, having only to get through the gums in order to be seen. A baby obtains food by sucking and not by biting, and so it is better that his teeth should be out of the way at first.

But deep in the gums, below the primary teeth, extending farther back in the jaw, are little groups of tooth-germs, which will some day make the second set of teeth, usually called the permanent teeth, because they are supposed to last the rest of our life. There are thirty-two of these little cells, and though none of them are teeth, or look in the least like them, they possess the power of making teeth of the various kinds we possess. But in nearly all cases, no third tooth will grow when a second tooth has been lost, because there is no other tooth-germ lying below the second tooth, as there was below the first tooth. In a few exceptional cases, however, nature seems to revert to earlier principles and provides a third set of teeth. Perhaps you have heard or know of such a case. Do you think it would be a wise measure if all could grow a third set?

Why Is It Birds Do Not Have Teeth?

The fact is, while she seems to follow a few general plans, nature delights in variation. All animals, of course, grow only by taking food into their systems. Most food has to pass through a number of processes before it becomes so changed that the forces of life in the body can utilize it in building up organs, cells, and tissues. In the case of man, we generally begin such preparation before we eat, by cooking the food. Animals below man do not cook food, but a great many of them partially prepare it in the mouth by chewing. They differ, however, a great deal among themselves in this respect, and the teeth are very different in different animals.

If you have a rabbit, you will find its teeth are very different from those of your dog, or of a cow, or horse. Nature has largely fitted her animal children with teeth which differ according to the food they eat. In the case of birds, she seems to have concluded, after trying teeth in some of the first birds that ever lived (ages ago), to dispense with teeth altogether, and birds simply swallow their food. It remains true, however, that the food must be prepared before it can be used to build up the bird's body, and so nature very kindly arranges a special organ to grind it before passing it on to the stomach.

The next time you get a chance, you examine the gizzard of a chicken; and in your next chicken dinner try eating it. You will find it tough. All birds have such mills and what they have swallowed, such as seeds, fruits, pieces of meat and bread, after being pretty liberally moistened with digestive juices, is passed into that mill, which is well supplied with muscles and grinds and crushes the food by pressing and rolling it around. After being thus prepared, it is digested, as in the case of other animals. Have you a canary or a polly? Why do you have to give it sand?

Why Do We Want to Lie Down When We Are Ill?

When we are ill, something has gone wrong with some organ of the body. Nature at once sets to work to make things right. She needs for this purpose all the energy and force that can well be spared. Of course, the heart must beat and we must breathe, but she stops the outflow of energy wherever

possible, so as to hasten the healing process. Force of gravity is always pulling us toward the earth. A baby falls to the floor when it tries to walk because it has not enough strength to resist this force.

We may not realize it, but a large amount of energy is required just to keep ourselves in an upright position. Less energy is required to sit than to stand. When we lie down, we relieve all the tension necessary to keep the body upright; all the muscles can be relaxed and the whole body rests. A further reason is that when we are lying down the heart does not have to work quite as hard, which is the same as saying it does not call for so much energy. When lying down, the body is nearly level and the heart does not have to lift the blood from the feet or force it up to the head. We are sure you will know now why our appetite is generally poor at such a time. You can also see why we lie down at night; that is our resting time, and nature impels us to stop the outflow of all energy possible.

Why Does Our Cactus Have Thorns?

The cactus you have is probably growing in a little tub or other holder in your living room. But in the almost desert portions of the Southwestern section of our country and in Mexico, they grow wild in great profusion. They are about the only plants that will grow there; and many animals would be glad to eat them, but Mother Nature, as ever mindful of the interests of her children, clothes the cactus in a defensive armor of prickles and thorns.

They give us an excellent illustration of what is naturally a wild weed, by cultivation (education), changing into a useful plant. Mr. Burbank gave it a chance. Nature responded by taking off the prickles and thorns. In effect, nature says, "Listen, if you will take care of my desert child and see that it is not destroyed by all manner of animals, I will take off its coat of armor and you will have a most nutritious plant for your cattle to eat."

Do you see how true it is that often weeds need only be given a chance to show their real worth? There may be other weeds that Mother Nature is patiently waiting for us to get acquainted with, when they may turn out valuable assets. It may be that before many years, we will find that many of the stalky weeds, reeds and wild grasses are just the thing to use in making paper, at least the cheaper kinds of paper. Did you ever find a wild thorn apple tree in the woods? Does this explain anything about that tree?

Why Do We Have Ten Fingers?

In the matter of fingers, we again note that nature delights in variation though following a general pattern, and we may be sure that some good end has been served by making the changes noticed in any particular animal. The original pattern, as we might call it, for the backboned animals was five toes on each limb, but there are all sorts of variations. We find only one distinct finger, or toe, for each limb in the horse; two, for the pig, and so on. But the original number was five. The hen, for instance, has only three and a half toes; when we examine the skeleton of its wing, which is really its arm, we find three and a half fingers there. In the chicken, as we see it, it is the same; but if we examine the hen's egg before the chicken is ready to break through the shell, we find that it has five fingers, or toes, on the end of each of its four limbs.

We believe you can tell us why it is best for the horse to have only one huge toe instead of five, and also why it is better for birds to have fewer, and notice how differently their toes are arranged. Do you know of any animals that have one of the original fingers developed into a thumb like ours? The next time you get a chance to look closely at a monkey, see if he has a thumb.

Where Do We Obtain Sponges?

In answering this question, we will tell you about a most wonderful city. An

ordinary city, you know, is a place where a great many people live close together, and so are able to enjoy some convenience not possible for those that live apart from each other, as on scattered farms in the country. In a city, by uniting their efforts, they have the advantages of paved streets, water, electric lights, and other conveniences. Sponges by their united efforts had constructed the city. They formed a jelly like mass that filled the space of the city except the tube like openings (the streets) through which circulated the sea water, with its many excessively minute forms of life on which the inhabitants fed.

Each little life was centered in a skin covered cell, which collectively formed

"WE WILL TELL YOU ABOUT A MOST WONDERFUL CITY"

are the buildings, streets and alleys of a city of the sea, formerly thickly inhabited by millions of excessivly small animals that had united their efforts for the common good.

But this city was not just long and broad, but a roundish irregular mass. Take a good look at a piece of sponge and notice the numerous little tubes running through it, opening into still larger tubes. In life, those tubes were lined with actively working cells, the inhabitants, that the houses of the city, all connected like the houses in a closely built city block.

What we have told you about shells and hair enables you to understand how the buildings, streets and alleys of this city were made. Masses of sponges are fished up from the rocks in shallow seas, cleaned, trimmed, dried, and form the sponges that we buy. Have you such a piece of sponge? Take a good look at it. Try and imagine the countless number of little lives that built it and once lived

in it. Some of the little tubes let the water into their city, others let it out, and they had mechanisms to keep the water in circulation. This shows us how on every hand nature has a most interesting story to tell, if we will only intelligently examine her work.

Why Do We Wink?

The eye is such an important and delicate instrument that nature has placed it in a bony socket; hung a pair of curtains in front of it; supplied the most perfect eye-water in the world to wash it; and, finally, fitted the curtains with little muscles that raise and lower them, which rests the eye for an exceedingly small fraction of a second by shutting off all light. This motion also applies the eye-water to the surface and washes off minute flecks of dirt that may have found their way there and keeps the eyeball moist.

You have guessed that we are talking about the eyelids and winking. Every time we wink, which we do every few seconds without stopping to think about it, the upper eyelid washes the front of the eyeball by means of a tear (the eye-water) that has come from the tear gland and has been spread over the inner surface of the upper eyelid. After washing, moistening and refreshing the eyeball, the tears pass through a tiny opening into the nose and so are disposed of. But also the small fraction of a second that the eyelids have been closed has rested the delicate mechanisms of the eye by which we see. Winking, like breathing, is involuntary, that is to say, we do not have to think about it. It is so important that it would never do to make it depend on our thinking to do it.

What Makes a Rocket Rise?

It is the same force that sends a bullet on its way, but in this case it is differently applied. Did you ever fire a gun? If so, it may have kicked you. Sometimes it kicks pretty hard. Well, in the rocket it is one continuous kick from the time the fuse is fired. You know how the rocket is made—the long, lithe shaft to keep it steady in its flight, the tube at one end. You know there is powder in the tube; the tube itself is too strong for the powder to burst, but when the fuse is fired great quantities of gas form. The tube cannot contain all the gas, and as it forces itself out with a rush, the air immediately in front does not get out of the way fast enough, so the entire rocket, tube, shaft and all, is just pushed away to make room for the escaping gas and as it is pointed up away it goes with a loud swish.

You know it will fly in any direction in which it is pointed. Do you believe you could make a long arrow, perhaps sharpened at one end, and instead of using a bow, arrange it in a tube something like a gun barrel only larger, put a tube in it like a rocket and shoot it? Does this answer help you to understand why a pin wheel turns round and round? Did you ever have any snakes in the grass on the Fourth? What makes them run around? One more question for you to help answer, why is the end of the tube pointed?

Why Do Our Fingers and Toes Have Nails?

We may be sure that they have some use or nature would not form them, and when you lose a finger nail, which you are sure to do sooner or later, you soon realize this fact. Do you think you could pick up a pin, or a penny, or many other small articles at all easily if you had no finger nails? And in addition, they protect the ends of the fingers in a great many ways. At first thought, the value of toe nails is not so apparent, but your shoes would hurt your toes more than they do if it were not for the nails.

Nails are a good illustration of the variations nature delights to employ though using the same general plan.

Nails are really the same as claws, such as those the cat uses for fighting and climbing and for tearing its food, and the hoofs which the horse uses for walking upon. The ancestors of the horse had five fingers and toes, as we

have, and a nail, or hoof, at the end of each; but all these, except the middle ones, have shrunk in the modern horse until we find only one that reaches the ground, and the remains of another on each side. Occasionally, we find a colt born with three or even four toes. The horse's hoofs, then, are really the nails of its middle fingers and middle toes, and are very useful to it. They are made of a material like our nails, and like them can be cut without pain. How many nails can you find on the cow's foot? On a chicken's foot? Have you got a rabbit? What does he use his nails for?

Why Do We Blush?

In talking about laughing and crying, we found that man was the only animal that exhibited such actions; evidently they have some relation to his reasoning powers. It is still more correct to say that man is the only animal that blushes. Nature has some wise end to serve or we would not have developed this peculiar action; and whatever that purpose may be, it has some relation to the faculties that distinguish man from other animals. Blushing is involuntary on your part, you cannot blush by trying to do so, but also the habit tends to pass away as we become mature. Then it must serve some purpose that, in after years, reason and judgment serve better, and thus the necessity for the involuntary act of youthful years ceases.

Man has a moral nature not less than reasoning powers, and civilization would soon fade out if men were not, as a whole, desirous of acting in a way generally held to be wise and right. Nature apparently uses blushing to strengthen such instinctive feelings, gradually withdrawing her assistance as reason becomes stronger. You may laugh or cry when alone, but you only blush when in the presence of others. And, further, you do not blush unless you think you have been detected in acting or entertaining thoughts that do not meet the approval of others, or it may be a fear that you are not going to act quite right when called on, and nature forcibly calls your attention to this error in conduct by suffusing your face with blood. Of course, you often blush when you have no occasion to do so, you have committed no impropriety, but you are afraid you have, or are going to, and that others know it, and nature seizes the opportunity to impress on you the necessity of avoiding unseemly acts, even in thought.

Why Do We Sneeze?

Because we smell by means of nerves in the nose, you are apt to think that smelling is the chief concern of the nose. But the nose is an organ that nature has put to various uses. You know to what wonderful uses an elephant puts his nose; he could not get along without it, and you know the pigs use their nose in rooting for food. In man, the chief use of the nose is, or should be, to breathe through. There is a sieve of hairs in the nose to strain from the air impurities of various kinds. The nerves and cells that attend to filtering the air have nothing to with smelling; but they are very sensitive and like all other devices of nature admirably serve their purpose.

Now and then some substance, it may be very small indeed but still quite capable of injuring the lungs, insists on trying to pass the portals (the sieve of hairs); at once the alarm is sounded and we sneeze, which is such a forceful expulsion of air from the nose, throat and mouth that the intruding particles are blown out. Some smells also excite the sneeze nerves, such as the smell of gases that would be injurious to the lungs. The nerves that sneeze do not care whether an odor be pleasant or otherwise, but are quick to take the alarm and forcibly expel pungent gases that would injure. They also act the part of warning sentinels when danger is stealing upon the air supply and the body is "taking cold." Probably some slight change in the lining membrane of the nose irritates them and the resulting sneeze is warning served upon the body, that it is contracting a cold. They even

extend their watchful care to the eye, and a sudden exposure to a strong light will often bring a sneezing protest. In such cases the sneeze floods the eye with tears. Sneezing once more illustrates the watchful care shown by nature in guarding bodily well-being.

What Is the Air?

In answer to several of your questions we have explained all living organisms, whether plants or animals, must have air in order to live. You now wish to know what air itself is. In a general way you know it is all around us. It constitutes a gaseous ocean resting on the solid or watery surface of the earth; we live at the bottom of that air ocean.

Air itself is a mixture (not a combination) of two principal gases, oxygen and nitrogen, nearly in the ratio of one to four. But there are present small quantities of argon, carbon dioxide (carbonic acid gas), water vapor, and traces of other gases. Oxygen is the essential preservation of life, but unless diluted, so to speak, with nitrogen, its strength would destroy life. Carbon dioxide, though small in amount, is the source from which plants obtain their carbon, and the presence of this gas in the air has a great deal to do with climate, since it is a great retainer of heat radiated from the surface of the earth, which is the only way air is heated, since the passing of light and heat in sunbeams does not directly heat the air, but only as it is reflected.

What Are Diamonds?

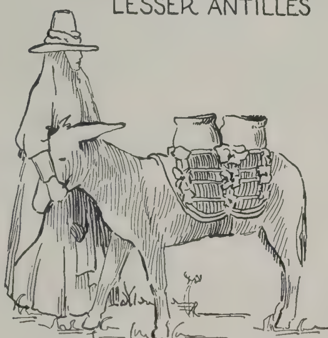
Strange as it may seem, diamonds are nothing but crystallized carbon. Chemically the diamond, the hardest of known substances, and lampblack, almost the softest, are identically the same. The diamond is the most valuable and the most interesting of all minerals. It is the hardest of all known metals; there is nothing it will not scratch. Its refractive powers are high, that is, it splits a pencil of light into a broad band of colors, hence the secret of its flashing appearance when exposed to light. One of the greatest points of interest about diamonds is the secret of their formation that nature guards so well. Evidently intense heat and crystallization under great pressure are needed. In the great diamond mines of South Africa the diamonds are found in the blue-mud filled volcanic pipes of extinct volcanoes. The blue mud is decomposed olivene rock, forced up from deep in the interior of the earth, but the diamonds found in it have been broken off from some other formation, far beneath the surface.

TRANSPORTATION
EARLY METHODS

PORTEUSE, OR CARRIER IN LESSER ANTILLES

CANADIAN PACKER WITH TUMPLINE

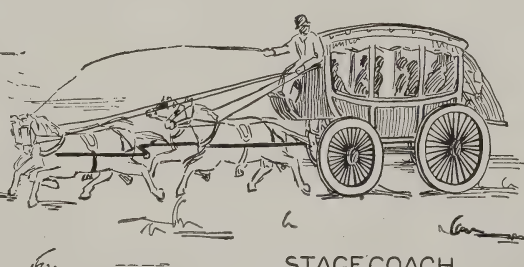
UTE SQUAW CARRYING CHILD



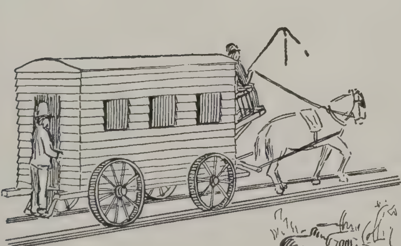
DONKEY CARRYING WATER JARS IN CRATE

HAMMOCK CARRIAGE FROM MADEIRA WITH TWO BEARERS

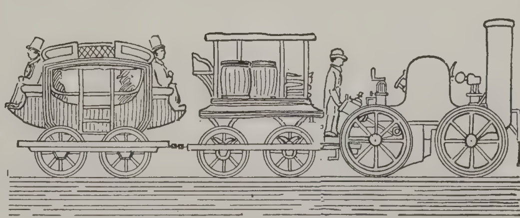
CONISTOGA WAGON



STAGECOACH

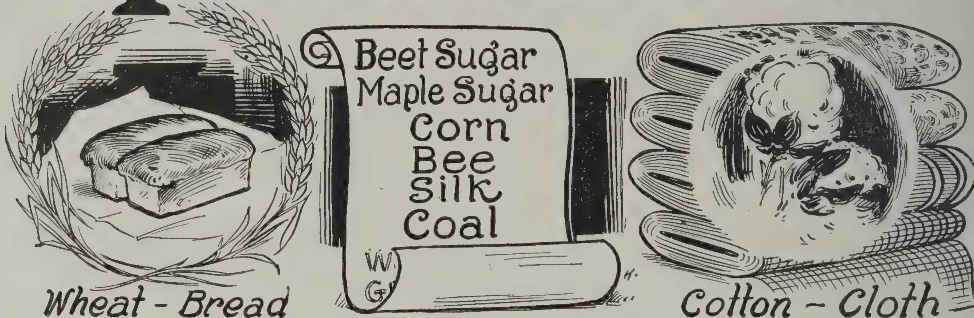


FIRST PASSENGER CAR



FIRST RAILWAY TRAIN IN AMERICA

Illustrated Industries



Knowledge pertaining to present day activities is mental nutriment, as essential to brain growth as food is to the physical body. One of the faults of the old education is that to obtain information, too great a reliance is placed upon memory of bare facts. Memory is the power of bringing to the service of the mind records already made in some mysterious manner on the multitudinous cells of the brain.

What Is Essential

It is of the utmost importance that we make such records clear and distinct and employ as many senses as possible. We recognize this fact in the new education. We are after 100 per cent efficiency. We desire to educate the eyes, the ears, the hands so that they may all contribute to the efficient whole. Then if memory cannot readily produce the record from one sense area in the brain, it can from another.

The Moving Picture Idea

The moving picture idea in education is illustrative of this principle. On the screen is flashed a picture of (let us say) animal life in other lands, sight is stimulated. The records thus formed reinforce the records gained from a study of text books. Memory now has other records to bring to the service of the mind. Knowledge of foreign lands thus acquired is retained, it is available for use at any time. This principle—interesting as many senses as possible—is the foundation on which modern learning rests.

The Use of Graphics

These Study Guides are prepared in accordance with this modern idea. We have presented graphics to aid in teaching geography and history, and we now present this section of Illustrated Industries. We have selected those industries that touch every day life. In war our energies as a nation are devoted to food, clothing and fuel wherewith to win it. An industrial war is now approaching and it is fraught with individual possibilities of success or defeat. We must prepare for it. The school children of today will be the industrial soldiers of tomorrow. Let us store the mind with ample stores of information concerning these vital industries. Let us interest the sight, arrest attention by pictured records.

THE STORY OF BEET SUGAR

The earliest attempt to produce sugar from beets in the United States was made in Philadelphia in 1830. This effort was a failure as were many more attempts made during the next half century. It was not until 1879 that success was finally attained, when a small plant was erected at Alvarado, California. However, not much was done in a commercial way until 1897 when the Department of Agriculture began investigations to determine where favorable conditions for raising sugar beets existed, to discover and make known suitable methods of cultivation, and to encourage the industry generally. It was deemed wise that a great industry destined to supply a large portion of our sugar should not be confined to a few states, but that factories should be scattered as widely as possible. The Department has statistics showing that there are about three hundred million acres in the United States, adapted to sugar beet culture. If but a fraction of this area were planted to sugar beets, it would furnish all the sugar we consume.

The sugar beet is said to be the most scientifically developed plant in the world. The length of the leaf stalk, the size, shape, character, number, placement, and pitch of the leaves have all been carefully considered, for the leaves must gather the utmost amount of sugar ingredients from the atmosphere and yet not be too much broken off by the cultivation. The present size, shape, length, texture of skin and body of the beet, sugar content and purity of the root, all are the result of a century's most scientific and painstaking investigation.

Beginning with a small, tough, woody root which contained little more than a trace of sugar, the beet has been developed to yield a heavy tonnage, of which in the best beets one-fifth is sugar, while for years past the average field beets have yieded of pure sugar one-sixth their total weight. The weight of crystallizable sugar contained in the beet is greater today than was the entire weight of the beet, when the industry was started and scientists began experimenting with it. In this work, we are assisting nature.

The sugar beet has an extensive fibrous root growth, which extends far below the surface. It is estimated that in plowing out a crop of beets, a ton of these roots to the acre is left in the ground to rot, to fill the soil with humus, and leave interstices which permit the lower strata of soil to become aerated and hence more fertile.

In certain parts of Europe, the increase in yield per acre of wheat, rye, barley, and oats has been 80 per cent during the past thirty years, as compared with an increase of but 6.6 per cent in the United States. Economists are a unit in attributing this increase in yield in Europe to the introduction of sugar beet culture which taught the farmers to grow a root crop one year in four in rotation with cereals. Results of even value have been secured wherever sugar beet culture has been introduced in this country, and should the further expansion of the industry duplicate Europe's experience throughout the United States, our yield of cereals would be practically double what it is at present. Thus the benefits of the beet sugar industry are not confined to an increase in the amount of sugar produced. It nourishes many other important industries and is regarded as the corner stone on which modern intensive agriculture rests. It is of course impossible to increase the area of land but it is quite possible to increase the production, and beet sugar raising is the stimulus to this result. It further keeps in this country a vast amount of money that otherwise would be sent abroad for this most necessary food.

To secure a heavy yield, fields to be planted to sugar beets should be thoroughly fertilized. The beets exhaust only a portion of the fertilizer, leaving the balance to enrich the soil for the three succeeding crops which should be grown before replanting the field to beets.

Sugar beets require deep plowing, ten to fourteen inches, or twice the usual depth. When using horses, farmers are inclined not to plow deep enough to secure maximum results and some of the factories have put in power plows.

Beets are drilled in rows, usually eighteen inches apart, 18 to 25 pounds of seed being drilled to the acre. The factories usually buy the seed, sell it to the farmers at cost price and deduct the amount from the payment for beets.

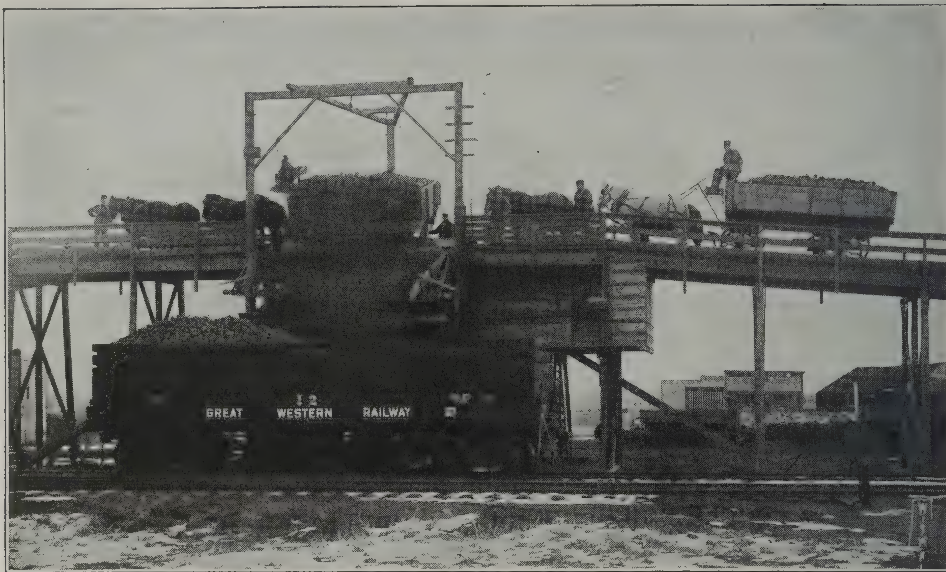
When the beets are up and show the third leaf they should be "thinned." The men in the foreground are "blocking" the beets, leaving a bunch of them every eight inches. Those in the rear are "thinning," or pulling up the superfluous beetlets, leaving one in a place, eight inches apart.

Sugar beets reach their greatest perfection when grown under irrigation and farmers in the semi-arid regions of the west have found the crop to be one of the most profitable.

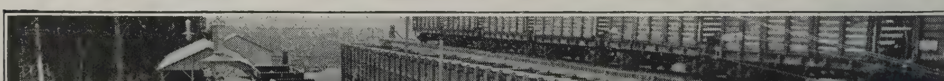
The leaves of the beet gather the sugar from the atmosphere by the aid of the light and deposit it in the root, none of it coming from the soil, hence the fields must be kept clear of weeds and foul growth, which would shade the beets and thus reduce their sugar content.

When ready for harvest the beets are plowed out, and the tops are then cut off by hand. The tops have considerable value as feed for stock. It is necessary to cut off all portions which grew above ground, as this part contains but little sugar.

If beets freeze and remain frozen until worked up, the sugar content is not diminished, but if they alternately freeze and thaw, they rot, and become useless. It is sometimes necessary to silo a portion of the crop.



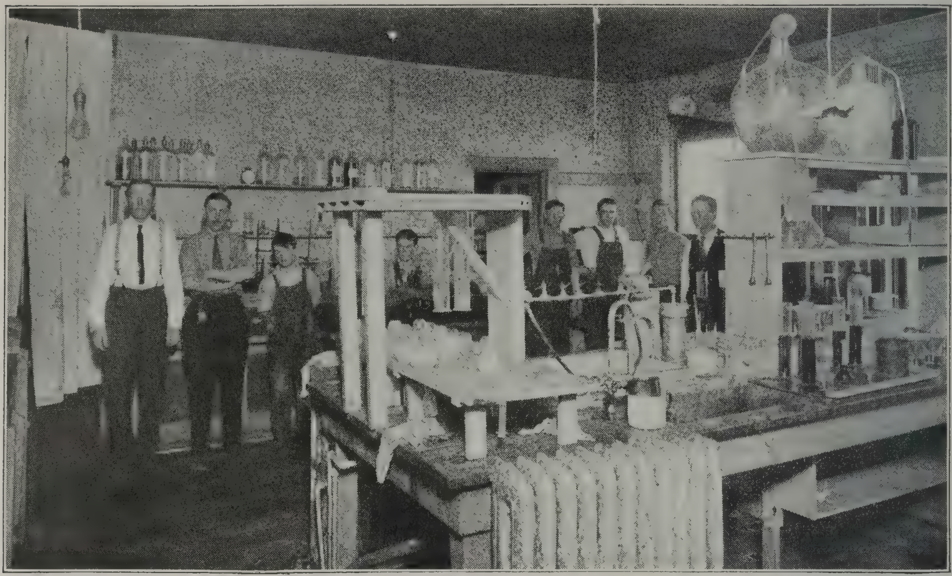
A factory may draw beets from an area of 50 miles. For long distance hauls the railroads are cheaper. At convenient points are receiving stations for the convenience of the growers.



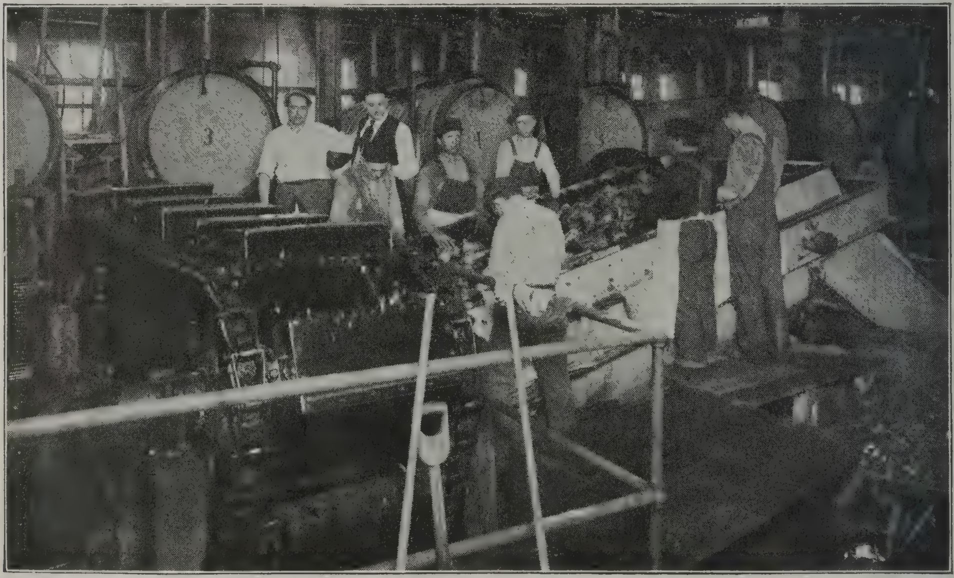
Beets arriving at the factory are either stored in bins or are floated directly to the beet washers. If used at once the cars are dumped as shown above by means of a hydraulic jack, and the beets fall into a flume filled with warm water which carries them to the factory.

At the factory the beets are stored in bins of from six to thirty-five thousand tons capacity. The bins are V-shaped, about 3 feet wide at the bottom, 20 to 30 feet at the top and from 20 to 30 feet high. At the bottom is a cement flume or channel in which they are floated to the factory.

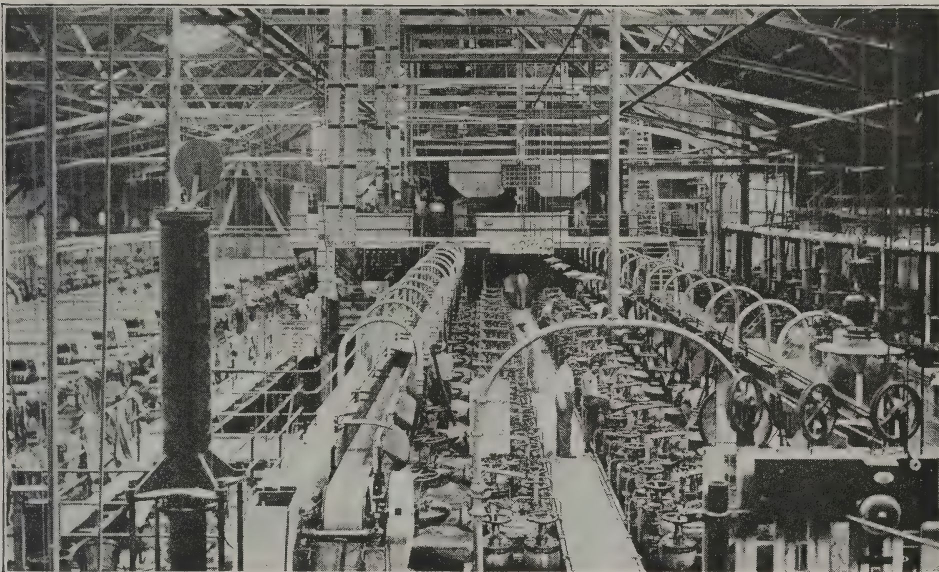
These factories cost from a half a million to three million dollars. They consume from 500 to 3,000 tons of beets per day, and during a "campaign" which usually lasts about three months will produce from 12 to 75 million pounds.



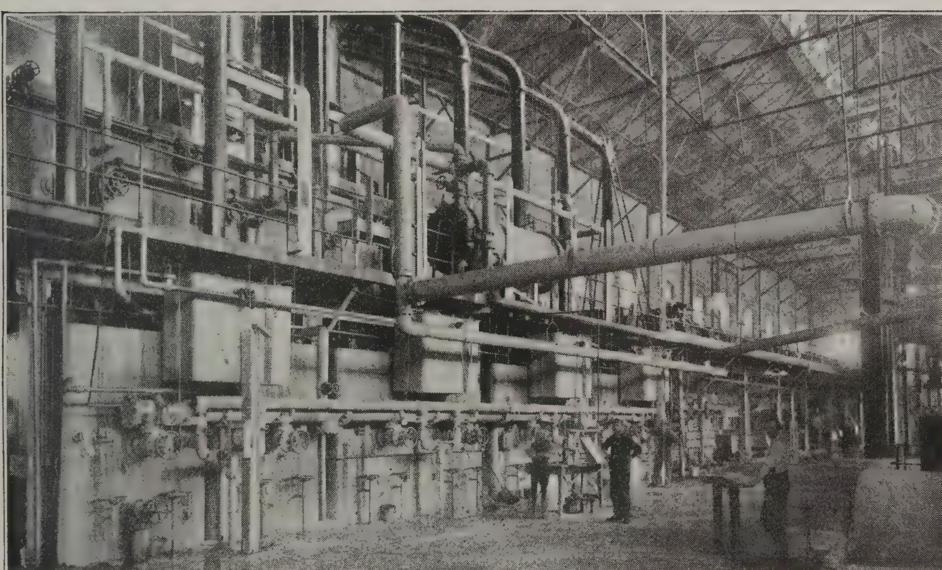
In a beet sugar factory each set of apparatus for performing a given process is termed a "station." In the chemical laboratory the juices and products from each station are tested hourly to check up the correctness of the work, and to determine the losses of sugar in each process.



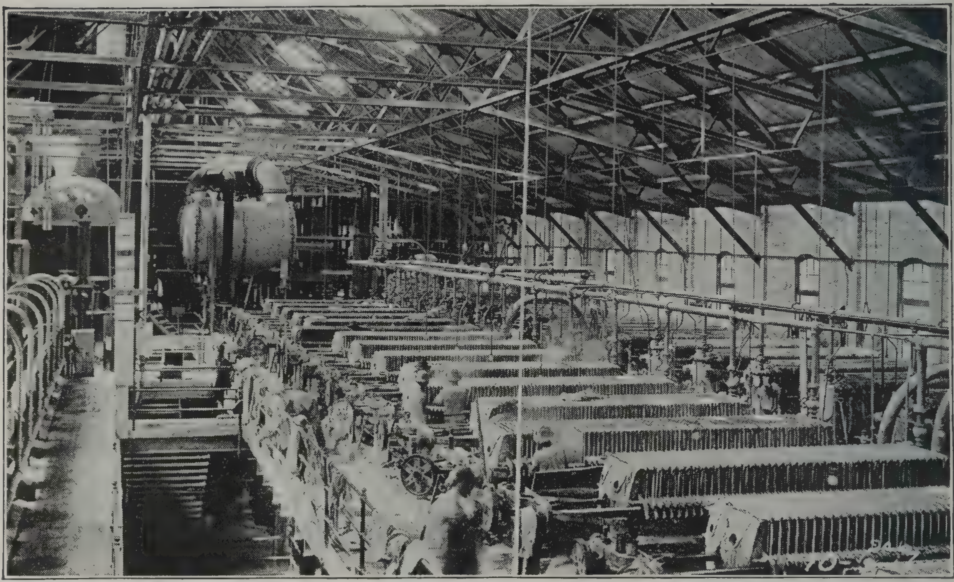
After being floated in from the bins the beets are thoroughly washed and then pass to the slicers, where with triangular knives they are cut into long, slender slices which look something like shoe string potatoes.



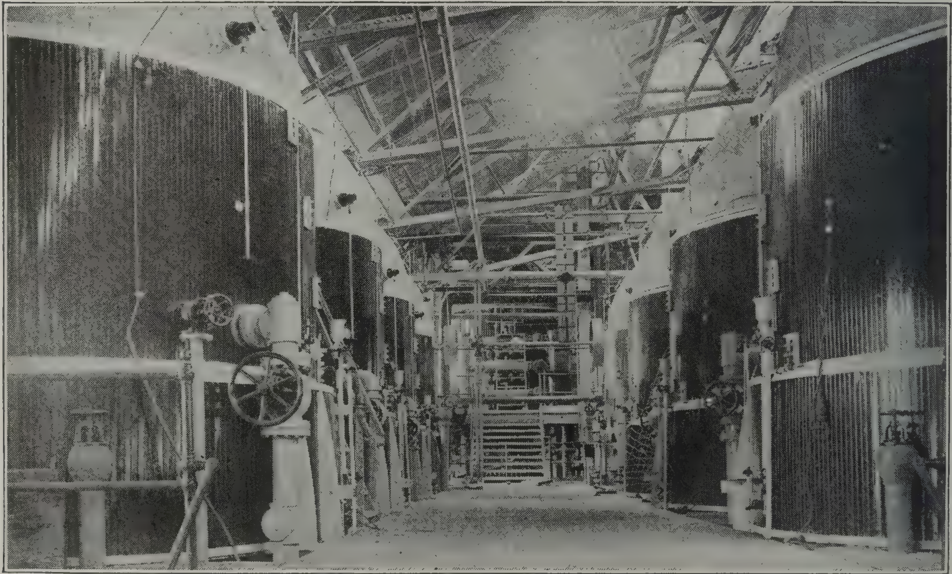
After slicing, the beets are packed tightly into cylindrical vessels holding from two to six tons each, the battery consisting of eight to twelve vessels. Warm water is run into the slices and coaxes out the sugar.



The warm raw juice is drawn into the carbonation tanks and treated with about 10 per cent milk of lime. This throws out the impurities, sterilizes the juice and removes coloring matter. Carbonic acid gas is forced through the lime juice in the tank to throw out the excess of lime.

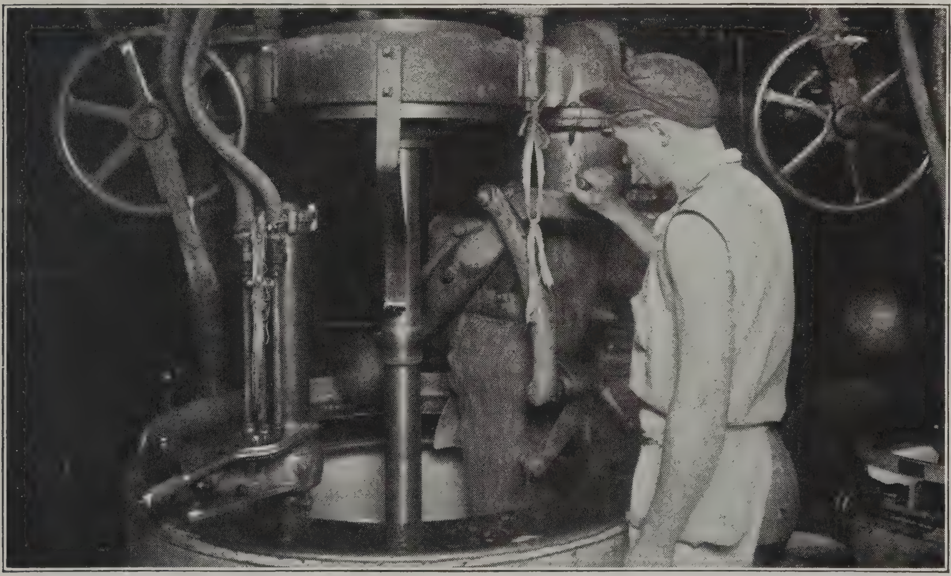


From the carbonation tanks the juice is pumped or forced through filter presses consisting of iron frames so covered with cloth that the juice passes through as a clear liquid, leaving the lime and impurities precipitated by it.

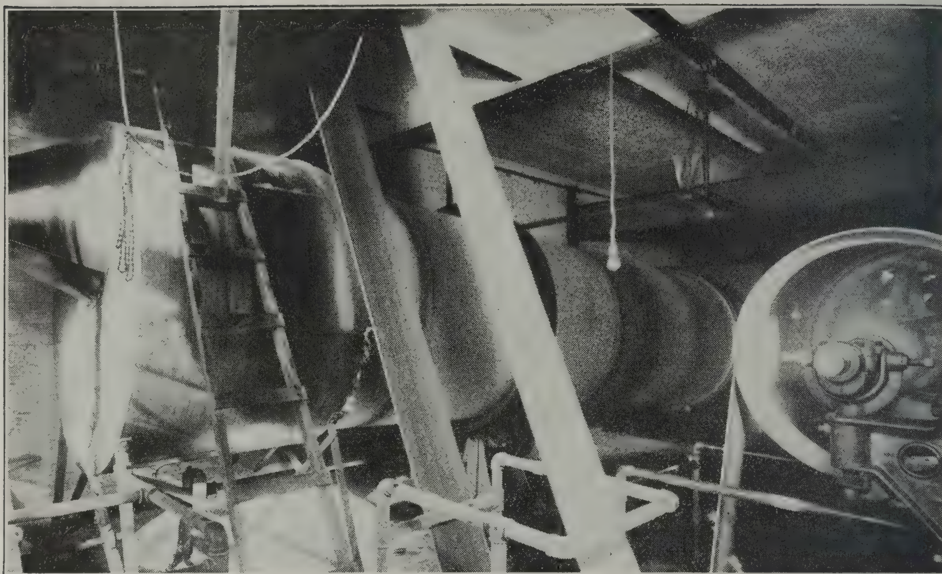


After a second and sometimes a third carbonation and filtration the juice is carried to the evaporators, commonly called the "effects," usually four large air tight vessels furnished with heating tubes. A partial vacuum is maintained in these which makes the juice boil out at a low temperature.

After a careful filtration, the juice from the evaporators, now called thick juice goes to the vacuum pans. These are large air tight vessels heated by steam in which the juice is further evaporated until crystals are formed.



The mass of crystals with syrup around them is let into a large open pan called the mixer and then into large perforated brass drums, called centrifugal machines. These revolve about 1000 times a minute, and the syrup is thrown out through the holes while the sugar remains.



The damp white crystals from the centrifugal machines are conveyed to horizontal revolving drums about 25 feet long and 5 to 6 feet in diameter. These drums have paddles which thoroughly stir the sugar.

After the sugar is thoroughly dried it drops to the sacking room where it passes through a chute directly into the sack. The flow is automatically cut off with each hundred pounds. Then an endless belt conveyor passes the upright sack past the sewing machine and it is sealed.

Storing millions of pounds of sugar is no light task and the sacks are elevated in the warehouse by means of an endless belt. It is worthy of notice that during its entire process the sugar is not touched by hands.

Formerly practically all of the beet seed used in America came from Europe, but it has been proven that superior seed can be produced in the United States. Sugar beet seed growing requires five years of the utmost skill, care and patience.

American farmers have only lately begun to recognize the high feeding value of sugar beet pulp, and now millions of tons of what was formerly considered waste are utilized in a highly profitable manner as feed for cattle and sheep.

THE STORY OF MAPLE SUGAR

Sugar is so essential as food that the cells of many forms of plant growth are given the mysterious power of secreting the ingredients of sugar from air and soil and combining them, and the juices or sap dissolves the sugar thus formed as you dissolve a lump of sugar in water; and as in the blood circulating in our body the nutritious parts of food are carried to all parts of the body and used to build up tissues, so the juice of the plants—loaded with nutritious sugar—carry it to all parts of the plant to increase its growth.

The Maple Tree

Among trees, the maple possesses this power to such a degree that it is named the sugar maple. This tree is one of our most beautiful and stately trees. The size of its leaves, the spread of branches, and its symmetry of form, make it one of the most desirable shade trees. The pride of many towns are its avenues, shaded by maple trees. In addition, the wood of the tree, the product of such nutritious food, is valuable for many purposes. But like sugar beets, and sugar cane, the sugar tree is of special value as a source of sugar. Though the tree does well in many sections, yet for sugar purposes, it needs a rather cold winter, a fair supply of snow and characteristic spring weather, a real divide between the sleep of winter and the activity of summer. These conditions are best met in our Eastern and Northern States, preëminently so in Vermont.

The Maple Leaves

We noticed the importance of leaves in the sugar beet. As you know, a maple tree is provided with a generous supply of leaves of a large size, and leaves are the mouth and stomach of trees and plants, and are busy during the summer in storing in the maple tree two of the ingredients of sugar—oxygen and carbon—water from the ground is the third and the innumerable cells of the tree are busy combining these ingredients into sugar. In the spring when Mother Nature rouses for work, there is the sugar all ready for the sap to dissolve and carry to limbs and branches wherewith to form buds and leaves for another year's work. In the sections we have just mentioned, the supply of sap is so generous that a portion can be drawn off for our purposes. Now it you have a tumbler of water in which a lump of sugar has been dissolved, you know you can boil the water away and the sugar will be left. That is what we have learned to do with the maple sap, boil the water away; if we boil the water all away, we have sugar, if only a part of the water is sent away, we have maple syrup, and now you see why maple syrup is sometimes called liquid sunshine.

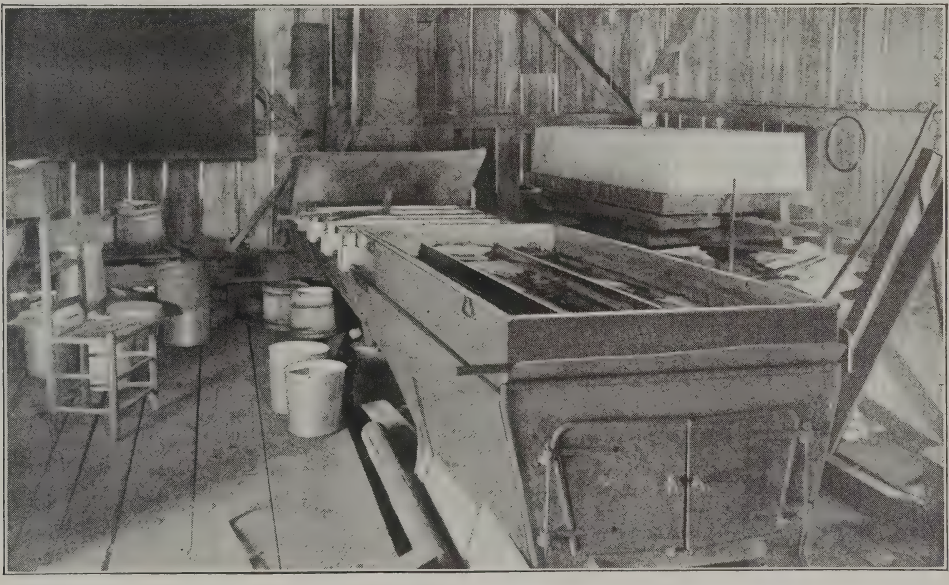
History of This Process

When the first settlers arrived in what is now New England, they found the Indians had learned this secret. Of course, the Indians had only the crudest appliances. Their method of tapping trees was to make a diagonal incision in the trunk of the maple, perhaps with a tomahawk, into the lower end of which was inserted a reed, or concave piece of bark, through which the sap was conveyed into a bark trough or other receptacle. The Indian method of boiling was to drop hot stones repeatedly into the clay or bark vessels containing the sap.

A section of forest in which the maple trees are sufficiently numerous to make the crop valuable is called, indifferently, a sugar bush, a sugar grove, or a sugar camp. Generally other trees also are numerous.

This is a spring scene, notice snow on the ground, the trees not yet in leaf. The man is tapping the trees. With a small bit, a hole is bored a little way into the tree, metal sap spouts are used and the sap is caught as it flows from the tree.

The sap is gathered daily. The sledge shaped body drawn by the horses is a stone boat, on it is placed the gathering barrel or tank. When the gathering is completed, the load is taken to a sugar house.



The sap, flowing from the storage tank, is regulated by fenders, and the boiling sap in the evaporator is kept at the same level all the time. As the sap passes from one compartment of the evaporator to another, it assumes more the consistency of syrup.

THE STORY OF THE HONEY BEE

We have told you the story of Beet and Maple Sugar. Bees do not make sugar, but they furnish us honey and in the long ago, before men knew how to extract sugar from cane and beets or from trees, they depended to a large extent on the bee to furnish them a supply of honey. And so it is that the bee is often mentioned in early writings. We are sure that you will be interested in the pictured story of the bee's work in providing us with honey.

Where They Procure the Honey

Bees don't make honey, they gather and store it. As if to provide for the wants of her children men, before they could learn the secret of sugar making, Mother Nature fitted bees to live together in well ordered communities consisting of many thousand bees gathered in rock cavities or hollow trees where the results of their combined labor, in extracting honey from flowers, are stored away, in a cunningly arranged collection of cells that we call a comb. This community of workers is, in a sense, presided over by a queen mother. But after all the community is a true republic.

A Hard Worker

The bee is one of the busiest of the world's workers and has long been the symbol of industry and husbandry. From these traits we get our expression of "as busy as a bee," while from its restless habits comes the saying of "having a bee in one's bonnet." "Quilting bees" and "husking bees," the picturesque ways in which our grandfathers and grandmothers got together for a frolic and to work for the benefit of one, derived their names from the community habits of the bee. In the summer time bees literally work themselves to death, gathering honey, nursing young bees, making wax and comb, ventilating the hives, etc.

How Bees Defend Themselves

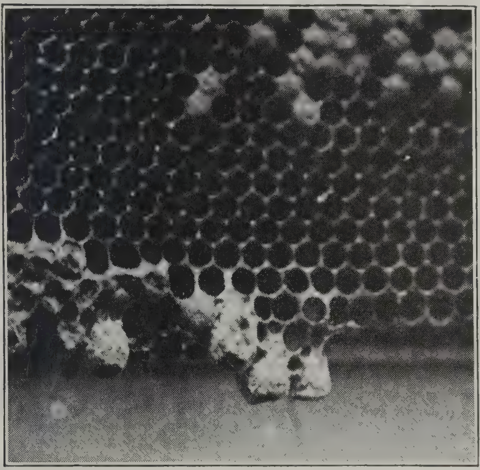
Mother Nature generally makes some arrangements for defense on the part of her children. So she has armed bees with a sting, and most boys know by experience that a good healthy bee and its sting is entitled to most respectful consideration. Honey bee's cousins—bumble-bees and wasps—are good fighters. Especially wasps, and if you are so unfortunate as to run into a colony of wasps you had beter retreat as rapidly as possible. When honey bees get down to business in defense of their stores, they generally do such a thorough job that they leave the sting in the quivering flesh.

The Workers

From what you have studied about bees, you doubtless know there are three kinds of bees in the hives. The queen, the workers, and the drones. The queen is literally the mother of the hive, and she does a most wonderful egg business. The drones are simply intended to give life and vivacity to the hive for a brief period. Our interest centers on the workers. These little fellows are constantly working, making comb, ventilating the hive, nursing the baby bees, and when they have nothing else to do, they fly out after honey. Life seems just one round of labor for them.

The Value of Honey

In these days of conservation, it is instructive and interesting to figure out the comparative food values of various articles ordinarily used. It has been determined by many careful experiments that honey is one of the cheapest of foods. A pound of honey contains as much nutriment as two pounds of beef-steak, two quarts of milk, two dozen eggs, sixteen oranges, or twelve bananas.

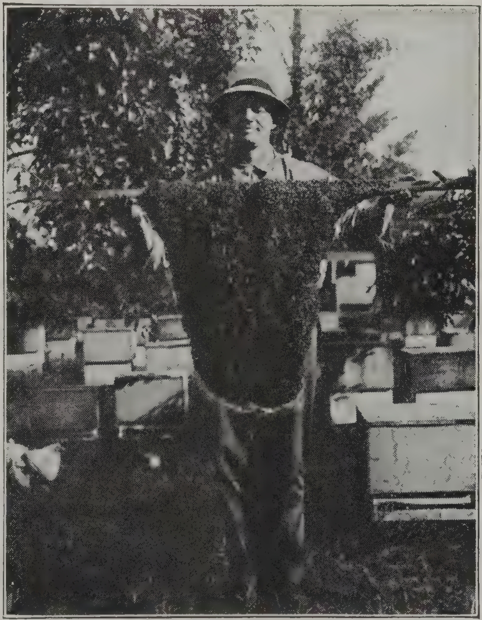


The Queen Cells

Evidently the queen mother is a very important personage. Her importance commences before she is hatched from an egg and is indicated by the food given her. The cell in which she is hatched is larger than the ordinary cell and the food on which she is fed is abundant and the workers are on the watch and don't allow a queen to develop until they are about to swarm, that is, sent out to form a new hive.

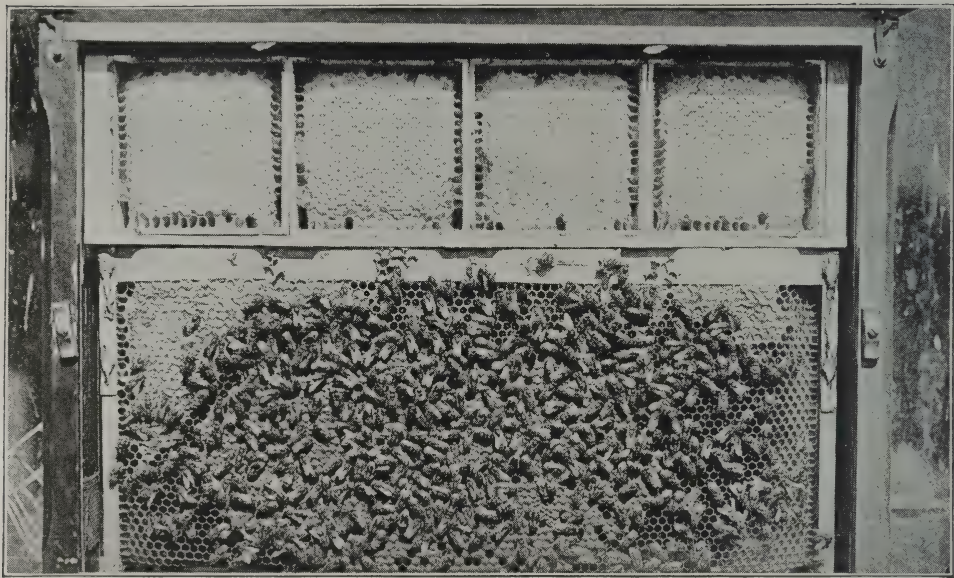
The Swarm

Whether the hive holds a sort of family council or not, we cannot tell, but certain it is that various signs foretell the coming flight. One is a sort of farewell feast. The bees gorge themselves with honey and, like most hungry boys and girls, they are good natured when they have had a good dinner and so permit their keeper to take liberties with them and do not resent it by stinging. It is always the old queen that leads the new swarm. It would never do to entrust such a particular piece of work to a young and giddy queen. The old queen has a plentiful following for thousands of the old workers follow their leader.



Of course, the bee keeper does not care to lose such a quantity of bees and he has a new home ready for them and uses various means to induce them to settle therein. In earlier days, before we knew as much about handling bees as we have now learned, the swarm often became a run-away swarm and disappeared in the forest to take lodgment in some bee tree to the delight of various animals that knew how to get their share of the honey.

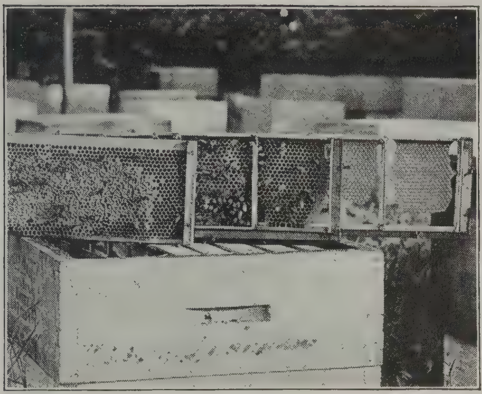
The Apiary



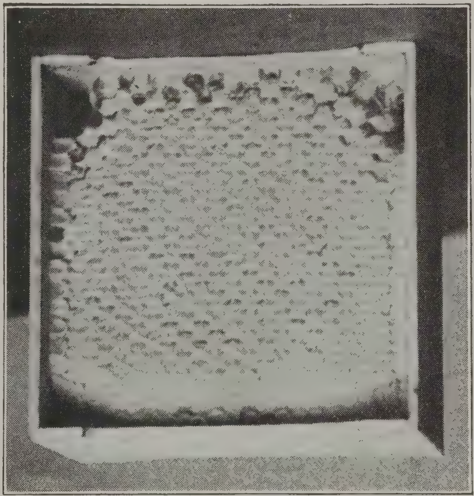
This is an observation hive. It is largely made of glass and the bees' method of work can be studied through its sides. It must however be closed up most of the time, or the bees will go on a strike.

It pays to place the hives amid pleasant surroundings. In this successful apiary, a trellis of grape vines is placed before each hive. Such a location is shady in summer and open to sunshine in fall and spring.

Helping the Bees



In this illustration is shown one of the ways in which bees accept the co-operation of men. In a state of nature, bees most industriously set to work to make new combs to fill with honey when they have finished work in one case. But this requires time and energy which the bee could more profitably use in extracting honey, work in which man cannot help him. It requires several pounds of honey to produce one pound of wax. Therefore the bees are given partially completed combs, or second hand combs, or even artificial combs. At any rate, the bees accept the situation and complete, repair, or make over the combs furnished them, and turn cheerfully to the work of filling them with honey.

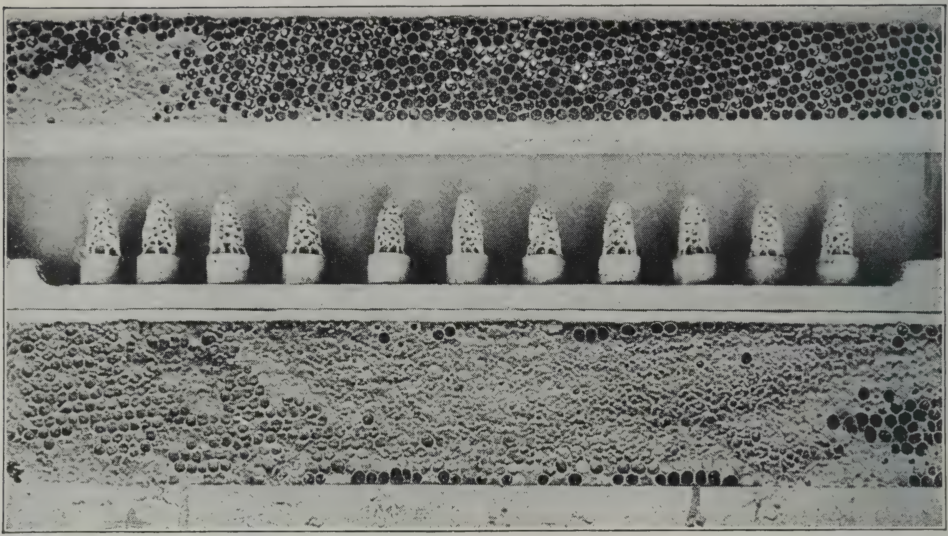


The Completed Comb

Here we see a piece of honey comb which just fills a little box that we provided the bees who had no idea they were working to make money for their owner, but thought they were storing up honey for their own use, that is, if they thought anything about it at all. That honey comb is a marvelous construction. You will learn later on that an engineer could not make a better disposal of the space at his command. It has required the work of several bees to fill a cell, or we had better say having begun to fill a cell, they complete that one before taking up another. Then if they intend to keep the honey some time, they sterilize it by an exceedingly minute drop of chemical and neatly put on a cap of wax.

Smoking the Bees

In this illustration, the man for some reason wishes to examine the inside of the hive. Perhaps he wishes to take out some honey. Bees have a decided objection to smoke, and when it is blown among them they gorge themselves on honey and can then be handled with comparative ease.



Bees for Sale

Bees are often raised to sell just as any fancy stock. The raising of queen bees is an important industry. The bee raisers make artificial queen cells in which the eggs result in queens.

But bees themselves are also sold. And even when the queen is shipped some workers must be put in the cage with her. Notice how the bees are being bumped off the comb into a box for shipment.


AGRICULTURAL IMPLEMENTS
PLOWS
PRIMITIVE EGYPTIAN
JOINTER ATTACHMENT
A.D. 1870
HARROWS
PRIMITIVE HAND
PRIMITIVE LOG
WHEEL SPRING TOOTH
A.D. 1884
HARVESTING
PRIMITIVE HAND SCYTHE
COLONIAL SICKLE
GRAIN CRADLE
THRASHING
EGYPTIAN-1500 BC.
HAND FLAIL
HORSE THRASHING

THE STORY OF WHEAT

The Great War taught the entire world a lesson on the importance of food. The industry that furnishes the world with food is after all the most important. An army cannot fight unless it is fed, so that national resistance is at an end when food fails. But it is just so with all of us. We cannot fight the battle of life unless we have necessary supplies of food. As this subject is so important we will consider first the story of wheat. The whole world is interested in this subject, not only for present needs, but for future supplies.

The Discovery of Wheat

It is not clearly known when or by whom wheat was discovered, but it seems to have been known from earliest times. It is mentioned in the Bible, can be traced to ancient Egypt, and there are records showing that the Chinese cultivated wheat thousands of years B. C. The wheat plant is a member of the grass family. The question is sometimes asked "will wheat grow wild?" For more than two thousand years scientists have puzzled over this question. From time to time, it is reported by investigators in various parts of the world that here and there wheat has been found growing wild, but every time a further investigation is made, it develops that wheat has been cultivated in that section by some one. But Mother Nature must have developed the grains—wheat, oats, rye, etc., by ways of her own, from original grass forms, and left the finishing touches to men, though we have no history of these steps.

Agricultural Implements

What has machinery done toward feeding mankind? Not so much, in some ways, and yet more than we would believe without careful study.

As we realize that the greatest nations have been agricultural, we may well wonder how the ancient farmers accomplished so much with their primitive tools—the crude plows, sickles and scythes. Agriculture was the hardest kind of manual labor. The strange thing is that conditions remained practically unchanged for thousands of years and the farmers of Europe, and our own country as well, down to the middle of the last century were still using the crude tools of the ancient Egyptians and Israelites.

Invention at last turned its attention to the farm, and by 1850 a new era had begun, with the introduction of agricultural machinery. Today, machines in great variety and of wonderful inventive genius are in use in all of the operations involved in soil preparation, planting, harvesting and marketing the product. We have illustrations showing all the operations connected with wheat raising, and showing the great improvements that have been effected in course of time. Be sure and study it carefully. It will add to the interest of this story.

Preparing of the Ground for Seeding

First the ground must be prepared. Mother Nature only furnishes the raw material, we must do the rest. The preparation is not essentially different for wheat than for other crops. On the bonanza farms of the West may be seen batteries of tractors, each drawing a number of plows, followed by harrows, and thus fifty or sixty acres may be prepared in one day.

After the field is ready it must next be seeded. Think what a task this is in fields so vast that the other end can scarcely be seen. Years ago, there was no way except to scatter the seed by hand. Then some one invented a seeder which turned with a crank and which, when strapped on the shoulder or held

in the hand, sent out clouds of seed. Next came a seeder made much the same way, but fastened instead to the wheels of a wagon; with each turn of the wheel a shower of seed was scattered. All seed, however, sown in this fashion had to be covered at once, and this made a great deal of work. It can be readily seen too that if the farmer was not expert and careful in scattering the seed it would not be evenly distributed and consequently there would not be a good stand of grain. Then, too, to insure proper growth, the seed should be covered to a certain depth, there must be not too much or too little earth placed over it.

Now-a-days we have various kinds of drills. The main advantages of drills are that they can be pulled by either horses or a tractor, and thus a great amount of ground can be covered in a day; that the exact amount of seed required per acre can be determined and planted; that it can be evenly distributed, and that all may be covered with just the required amount of earth.

The Growing Crop

Though wheat does not require tilling as does corn or cotton, many things tend to destroy or injure the growing crop. If it is winter wheat, that is wheat planted in the autumn, the winter may be too severe or too dry and much of it may be lost. If it survives, the winter insects, like chinch bugs, grasshoppers, or the Hessian fly may attack it, or sometimes it becomes diseased and turns black, "smut" the farmers call it. But surviving all of these, the wheat grows apace, and by and by the tops of the grain become heavy and begin to droop, the color of the fields turn from green to yellow, and then the farmer knows that the time has come for him to harvest his crop.

Harvesting

It is interesting to note the successive steps that have led up to modern harvesting machinery. First in point of time was the sickle. Turn to the Bible stories, and read the story of Ruth (p. 3395). Notice the sickle? Then came the cradle. Did you ever see one at work? Look at the full page illustration to

which we have referred you. It would be impossible to take care of the immense fields of wheat now grown. As usual, when necessity arises, someone comes to the rescue. You know necessity is the mother of inventions. The story of the invention of the reaper is so interesting, we will tell you about it.

The Machine That Made Bread Cheap

Cyrus Hall McCormick was brought up on a Virginia farm. As a boy of fifteen he was accustomed to go into the wheat fields and "cradle" the grain with the hand reaper, and it is worthy of note that at that age he constructed a superior hand implement by means of which he was able to harvest as much wheat as a full grown man. But his father was more than a farmer. On his place he had a large workshop, a saw and grist mill, and smelting furnaces. In all of these young McCormick learned practical mechanics and made several minor inventions. As he grew up, he became absorbed in a desire to invent a mechanical reaper. His father had tried this and failed, losing in his experi-

ments much money, and he discouraged his son. But the boy persisted. He found that his father's machine would cut grain that stood perfectly straight in the field, but he knew that a practical machine must cut grain whether it stood straight or was beaten down—lodged—by wind and rain. The grain must be cut, stalks and all, no matter how it happened to stand.

In his father's shop he worked patiently, making every part himself, and finally in 1831 produced the first reaper that ever really cut a field of grain satisfactorily. The four great essentials were those of the machine of today: a vibrating cutting blade, a reel to bring the grain within reach of the blade, a platform to receive the falling stalks, and a divider to separate the grain to be cut from that to be left standing. The machine was drawn by horses, and its work astonished the farmers who saw it in operation. With it one man could do the work of many, and the problem of handling the great wheat field of the future was solved.

Harvesting Machinery of Today

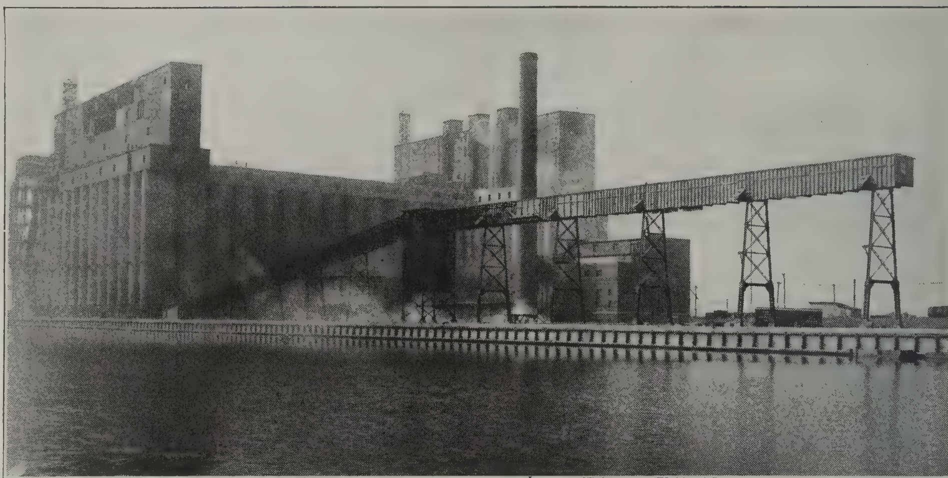
From the little blacksmith shop on the Virginia farm, the making of reapers has grown to a vast industry, and today more than 2,000,000 reapers are at work in the wheat fields of the world. Since then many improvements have been added and today the farmer uses a large machine drawn by horses—a sort of combination of reaper and binder—which cuts a wide swath on one side and at the same time tosses bundles of grain neatly tied, to the other. This is called a "self-binder." An attachment called "a bundle carrier" goes with the binder which carries the sheaves until enough are held to form a shock. In the larger fields of the West is used a special machine called a "header" which nips off only the head of the grain, and saves the farmer the labor of handling the straw. In some places machines are used which not only cut the grain, but also thresh it, so that all the farmer needs to do is to pick up the sacks of grain.

Threshing

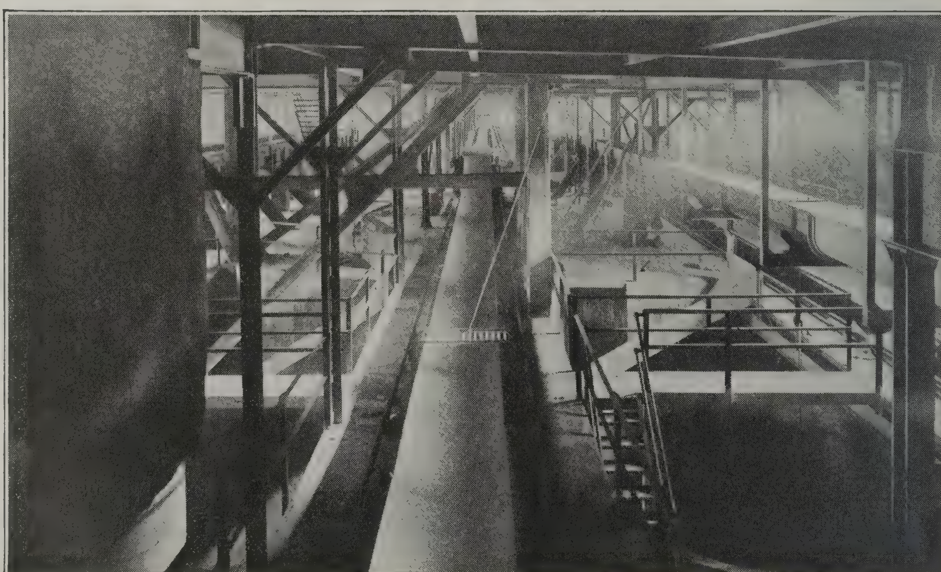
The wheat being harvested the next step is to shell the wheat off the stalk and gather it in one place. This is called threshing. Note on the illustration to which we have referred you the old and the new methods. See how true it is, as necessity for more wheat arose, means were invented to take care of the larger crops. Notice the use of oxen by the Egyptians, the hand flails of a century ago. The use of horses, common about the time of the Civil War, is a return to ancient usage. After the horses completed their work, the straw was tossed to one side, the grain and chaff passed through a fanning mill and the chaff blown away.

Marketing the Wheat

After the wheat its threshed it must be sent to markets. It must be gathered at great milling centers like Minneapolis or be sent abroad to feed the people of other lands.



Near the wharves of most large cities along the coast and on the Great Lakes, and on the railroad lines in many inland towns and cities, you will see very tall buildings of a peculiar shape where grain is stored. It is necessary to have warehouses built for this purpose, since grain when shipped in large quantities cannot always be immediately used.



Special machinery has been devised for handling the vast quantities of grain with a minimum amount of labor, and a car or a great boat load of wheat may be unloaded in a fraction of the time necessary if it was necessary to depend on the strength of men alone.

THE STORY OF A SACK OF FLOUR

The process of turning the wheat into the flour of which we make our bread is called "milling" and is one of our great American industries. In very ancient times saddle stones were used for grinding wheat into flour, the wheat being placed in a hollow stone and rubbed with a rounded stone rocked backward and forward. Half civilized people of today still use them.

About the beginning of the Christian era stone crushers, called "querns," were used. Many years afterward specially hewn millstones, moved by slaves or oxen, were introduced. Later, water wheels and wind wills were used as motive power, and lastly steam.

As late as 1870, however, the flour of America was still being ground between millstones, and it was a much inferior flour to that produced today. The roller process was introduced from Hungary in 1870 and revolutionized the American milling industry. By the old process of grinding between millstones, it was hard to separate the "middlings" of the wheat kernel from the bran, although they are rich in the gluten that gives wheat flour its chief value in bread making; hence the middlings were wasted. By the present roller process they are saved and produce the high-grade patent or white flour of today, with greatly enlarged profits to the manufacturers. The middlings are that portion of the kernel between the bran coverings and the starchy central body.

A Grain of Wheat

Right at the start we must form the acquaintance of a grain of wheat. We will need for our purposes a good microscope. Mother Nature never packed a greater amount of nutritious food in such a limited space, and with the wisdom displayed in all her works she mixed the ingredients in just the proportion to form an ideal food. For protection, she threw around the central mass five golden brown bran coverings, which, however, are rich in food values as the makers of breakfast foods know. Within these bran coats is a shell of glutinous matter, hard, yellow and half transparent. When you chew some wheat for several minutes you find yourself rejecting the bran, but you continue to chew the inner kernel, composed of gluten, starch and the germ. It is the gluten that holds it together in your mouth, the germ gives it a slightly sweet taste and the starch cells give it body.

Milling

The process of milling is to remove the bran coats, separate the germ and crush gluten and starch to a powder of velvety softness. When the entire wheat kernel is ground into a meal it is called "graham" flour. When a portion of the bran is removed, but the germ and fine bran are retained, the product is called "whole wheat" flour.

Various theories exist as to how much of the wheat should be used in making flour. Some contend that every portion has its usefulness, and that "graham" flour is the most healthful. Others say that the outside coat, composed principally of silica, is indigestible and should be removed, but that all other parts should be retained. By far the greater portion of the entire amount of flour produced is the high-grade white flour from which the germ and practically all of the bran have been removed.

A Modern Mill

In the many factories the raw material is taken in at one end and comes out at the opposite end as a finished product. There is no such fine progression in making flour. The wheat indeed comes in at one place and at another goes out as flour, but in the process of milling, parts of it may go from top to bottom of the big mill thirty times. Instead of a factory where everything moves along from hand to hand or machine to machine, the flour mill is like a human body—a huge frame-work, like the bones; with thousands of carrying devices, "elevators," "spouts" and "conveyors," like the veins and arteries of the body. It is an intricate and intensely interesting process, the result of years and years of experience in the "milling" of wheat.

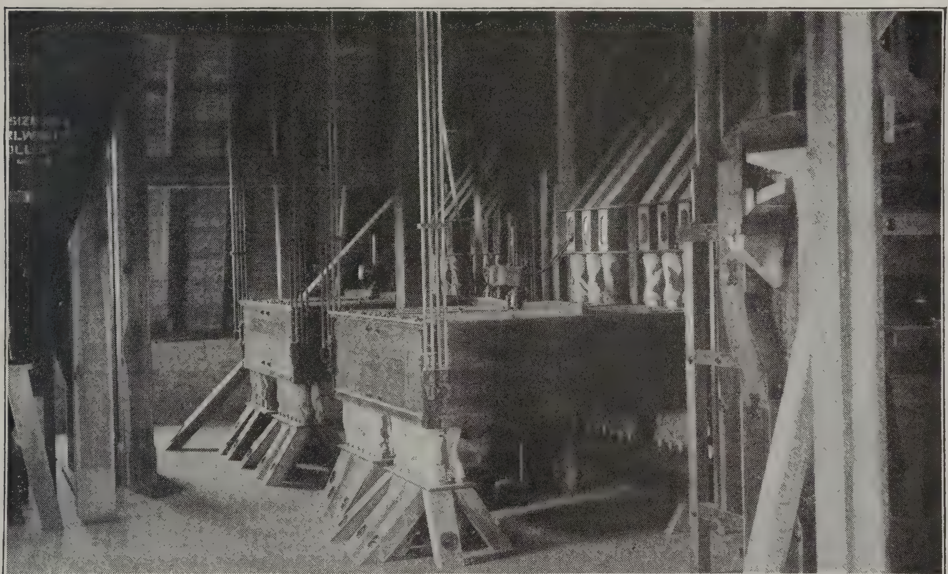
Notice the large number of windows, practically half of which are open. In milling today, as in practically all of our great industries, cleanliness is the

watchword, and dirt has no foes as strong as sunlight and fresh air. For that reason an up-to-date mill is practically all windows that the sunlight and the fresh air may have an opportunity to reach every cranny and every crevice.

At the right of the illustration is shown the elevator into which the cars of wheat are unloaded. Various labor saving devices are used for this purpose, sometimes a series of buckets working on an endless belt quickly scoop the grain out of the cars, and at other times it is deftly picked up by the suction of a strong current of air through long flexible spouts. Inside the elevator the wheat is elevated and placed in large tanks or bins until the mill is ready to use it. Then it is conveyed by means of large carrying belts and elevators to the scales room as shown in the illustration of "A Simplified Flour Mill," where

it is carefully weighed. Then follows a series of cleaning operations. Weeds of many sorts have grown luxuriantly with the wheat and their seeds are mingled with the grain. To grind these with the wheat would change both the color and the flavor of the bread. The first task then is to separate the tare seeds and to clean the wheat. The old familiar process of sifting and aeration is used. Many siftings and shakings rid the wheat of all seeds smaller than itself. Drafts of air applied at different points and in varying directions blow away the chaff, bits of straw and the light-winged seeds, and a special process of separation takes out the troublesome cockle seeds.

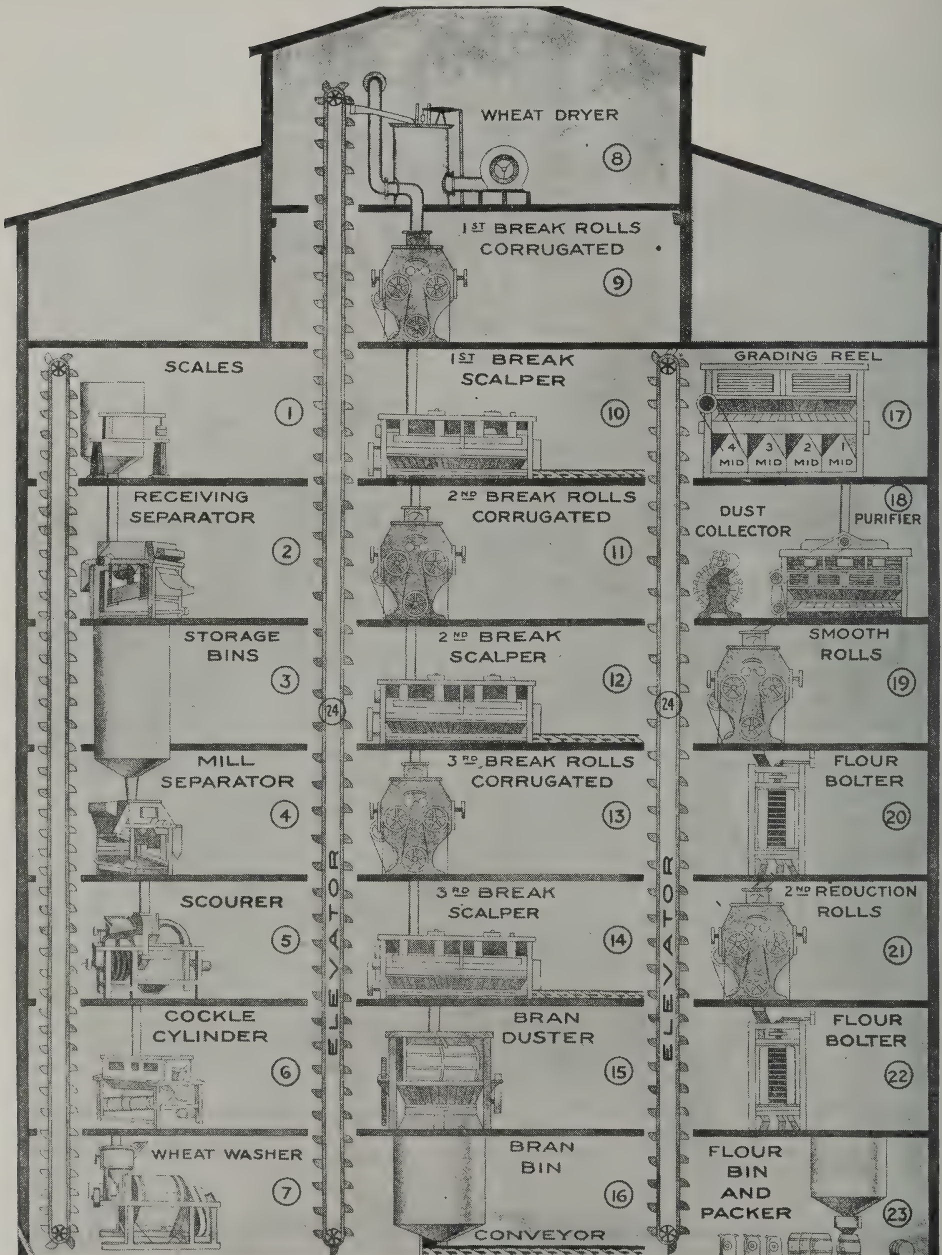
The machine for removing the cockle consists of an inclined metallic cylinder on the inside of which are small indentations just the size and form of cockle seed. Running through the center of this cylinder is a stationary apron. The wheat to be purified is fed into the revolving cylinder, the cockle falls into the indentations, is carried round with the cylinder until it gets above the apron,



when it falls by its own weight, is caught by the apron and thus separated from the wheat. The wheat grains are then "scoured" clean and bright in a rapidly whirling cylinder, "brushed" still more furiously, moistened and washed, that the coats of bran may not be too easily powdered but may be separated in flakes.

After this cleaning process has been perfected the wheat, measured by the most perfect automatic device, which by the simple principle of gravity separates from the flowing stream of wheat just enough for a barrel of flour (about five bushels), drops to the floor where the rollers begin their work of crushing.

The early reductions serve to crush the grain slightly, remove much of the bran and bring the remainder, after several crushings, to the "granular" stage. At each reduction some starch cells are crushed and some flour produced, none of which is allowed to escape with the less valuable bran, but is bolted out and reserved for the various grades of flour.



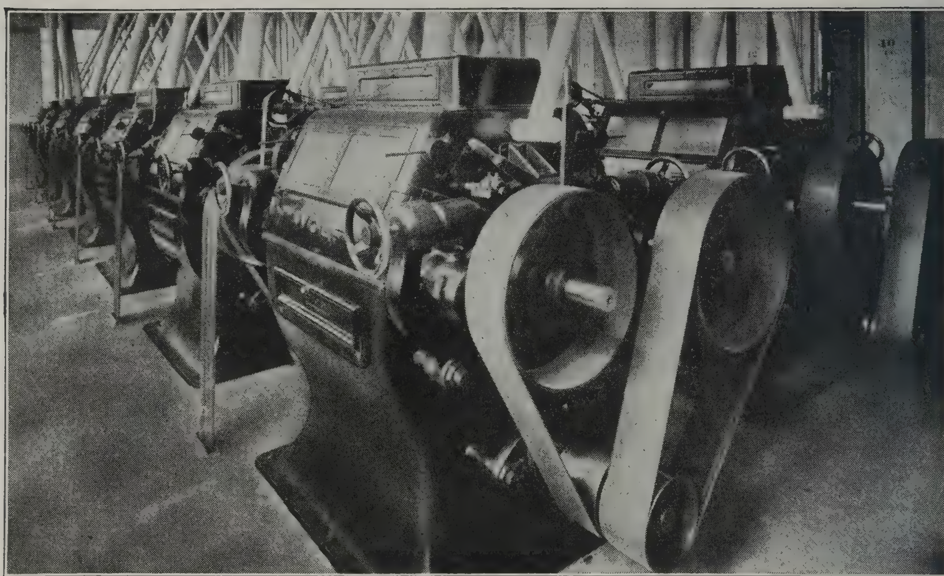
Cross Section of a Mill

To give vividness to the story we will give a cross section of a modern flour mill. Follow the course of wheat from the time the grain arrives from the elevator at the top of the mill (number 1 to the left) by means of the key and the diagram until it arrives in the form of flour at the lower right hand corner (number 23).

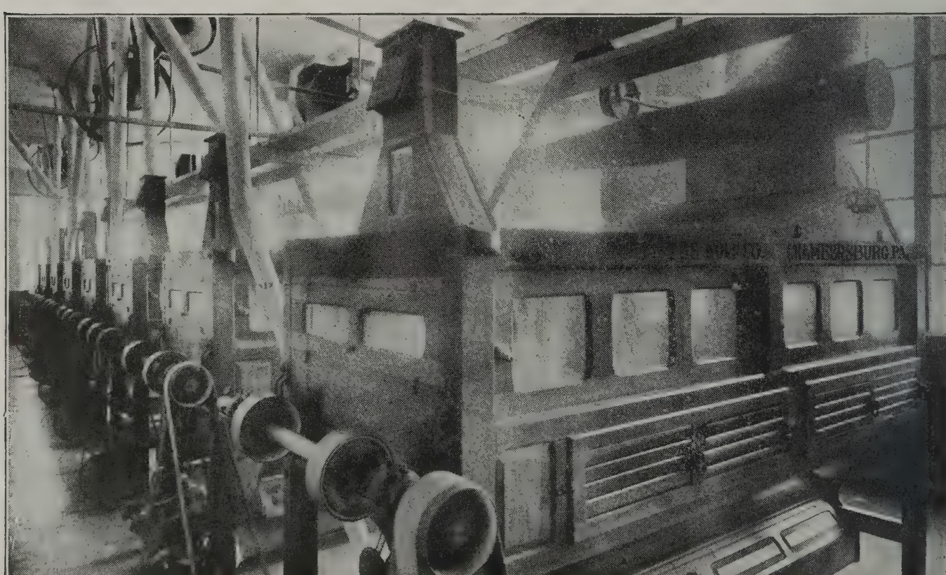
(1) Scales, for weighing wheat as it is received.
(2) Receiving separator, for separting other kinds of seeds from wheat.
(3) Storage bins, for reserve supply of wheat in advance of mill requirements.
(4) Mill separator, for further separating foreign seeds from wheat.
(5) Scourer, for removing dust from wheat kernels.
(6) Cockle cylinder, for removing all round seeds.
(7) Wheat washer, for thoroughly cleansing wheat.
(8) Wheat dryer, for drying wheat after washing.
(9) First break rolls, for rupturing bran, enabling bran and germ to be separated from interior.
(10) First break scalper, for sifting middlings through bolting cloth to separate from bran.
(11) Second break rolls, for further loosening the middlings from bran.
(12) Second break scalper, for separating more middlings from bran.
(13) Third break rolls, for further loosening middlings from bran.
(14) Third break scalper, for final separation of middlings from bran.
(15) Bran duster, for dusting low grade flour from bran.
(16) Bran bin, for packing bran for shipment.
(17) Grading reel, for separating middlings by sifting through various sizes of bolting cloth.
(18) Dust collector and purifier, for cleaning and purifying middlings by air and sifting.
(19) Smooth rolls, for grinding purified middlings very fine to flour.
(20) Flour bolter, for sifting flour from purified middlings.
(21) Second reduction rolls, for further grinding of purified middlings.
(22) Flour bolter, for separiatng flour from purified middlings of second grading.
(23) Flour bin and packer, for packing flour for shipment.
(24) Elevator, for raising products to the various machines.

The first set of rolls are corrugated and so adjusted as to "break" each grain of wheat into twelve or fifteen parts. The "breaking" process goes on through five different sets of rolls.

Closely allied with the rolling process is the bolting process, which, working hand in hand with it, has made modern flour making so perfect. The bolting process consists of a series of sieves—a sifting of the broken grain so that it is finally, after repeated breaking and sifting, a flour. The bolting machine contains a number of sieves covered with silk bolting cloth with varying mesh or number of threads to the square inch. Yards and yards of this costly silk bolting cloth are used to separate the fine flour, and when we realize that it is made to pass through this silken fabric we no longer wonder at the velvety softness of flour. Over and over the granular part is crushed and recrushed and the fine flour sifted out. Over and over the "middlings," as the sifted product of the rollers is called, are purified by siftings and aeration. At one period the germ, which, being easily flaked is not so readily pulverized, is removed before the product reaches the flour stage. If ground with flour, the germ would injure the color and affect its keeping qualities.



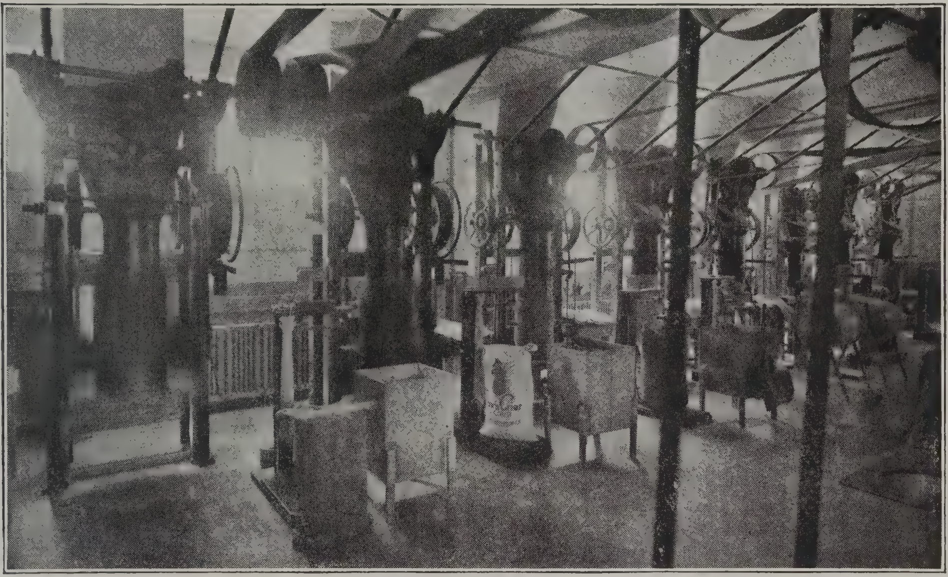
Finally as a last precaution and in addition to all previous processes, the flour is again sifted through finest silk bolting cloth. In these various reductions about 70 per cent of the grain is saved for food and 30 per cent becomes bran and shorts.



THE STORY OF A LOAF OF BREAD

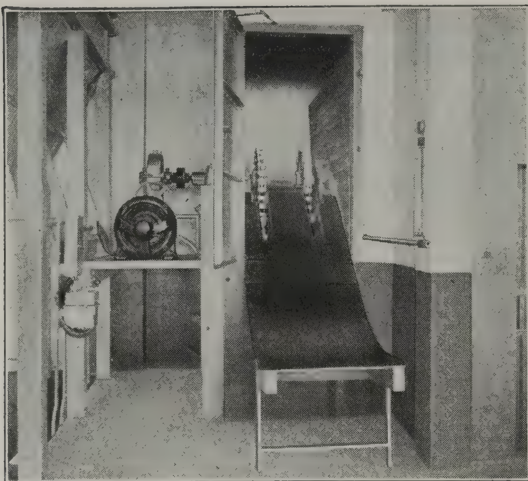
Bread is one of the earliest, the most generally used, and one of the most important foods used by man. Without it the world could scarcely exist. Like a romance reads the history of bread as a food. In the destinies of mankind it has played an important part. The progress of nations through their various stages of development can be traced by the quantity and the quality of bread they have eaten.

In the civilization of man no other food has played so important a part. His evolution from the stage of a semi-barbarous savage to that of a highly civilized being has been due, to a large extent, to its influence. It has turned him from war and the chase to the peaceful pursuits of agriculture.



The word bread comes from an old word "bray," meaning to pound. This came from the method used in preparing the food. Food which was pounded was said to be brayed and later this spelling was changed to bread. Properly speaking, however, these brayed or ground materials are not really bread in our sense of using the term until they are moistened with water, when it becomes dough. The word "dough" is an old one, meaning to moisten. In olden times this dough was immediately baked in hot ashes and a hard indigestible lump of bread was the result. Accidentally it was discovered that if the dough was left for a time before baking, allowing it to ferment, it would, when mixed with more dough, swell up and becomes porous. Thus we get our word "loaf," from an old word "lifian," which means to lift up.

We are now to tell you by the aid of illustrations the story of a loaf of bread. Follow the flour from the time it arrives at the bakery until it is ready for the table. Notice what a large part of the work is with machinery.

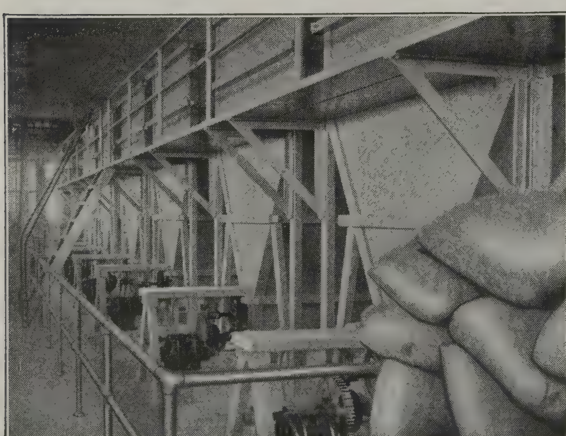


Automatic Flour Elevator

When the flour reaches the bakery it is unloaded from the cars and placed on an automatic flour elevator (electrically driven) which delivers it still in the original sacks to the flour room on the top floor. This elevator is used exclusively for flour, insuring absolute cleanliness and freedom from dust and moisture.

Flour Room

In the flour room, after being carefully selected and rigidly tested, the flour is blended, that is, different kinds are mixed together so as to get a uniform mixture, and then bolted or sieved through the finest quality of silk mesh so as to insure that no impurities will remain.

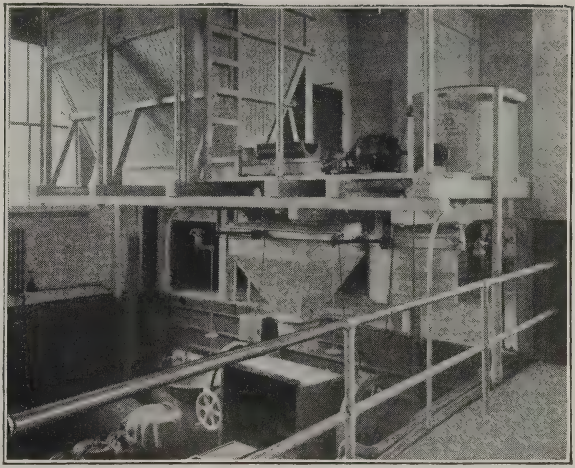


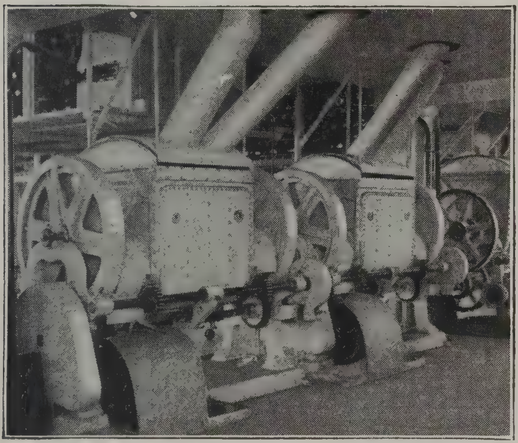
Storage Bins

After blending and bolting the flour is automatically conveyed to these snowy storage bins. Each bin holds a half ton of flour. Each has its own direct connected automatic conveyor which takes the flour to the weighing hoppers as needed.

Weighing Hoppers

The weighing hoppers receive the flour from the storage bins above. The scale beam for each hopper is set to the exact weight of flour indicated by the formula and automatically closes the hopper when this amount of flour has entered it. The round tank at the upper right is the water tempering tank. Below is the automatic water scaling tank operated on the same principle as the automatic flour weighing hopper.



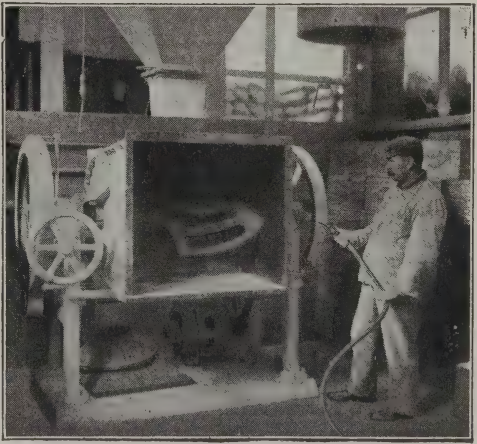


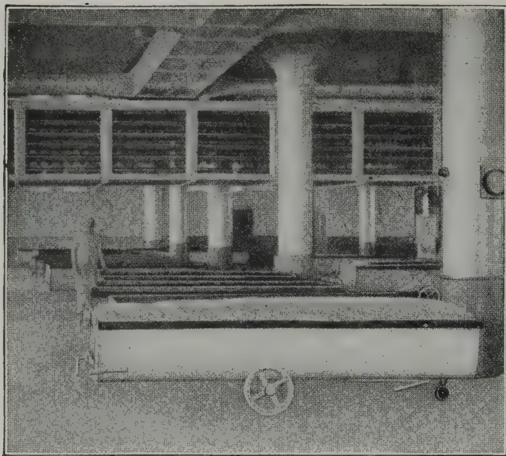
Mixing Machines

From the automatic hoppers the flour, water and other ingredients are conveyed to the dough mixers. Each mixer holds a half ton of dough. The tireless arms of shining steel knead the dough with a thoroughness unequalled by any other means.

Cleaning Mixer with Compressed Air

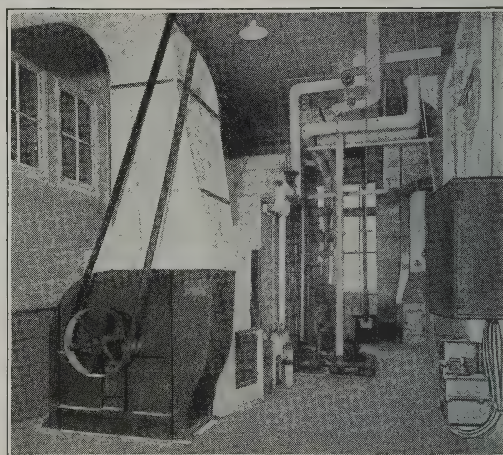
Cleanliness and purity are the first requisites in a modern bakery. A small army of attendants is constantly scrubbing, cleaning and polishing throughout the great plant, which might fittingly be called the "City of Cleanliness." Every machine is scrubbed daily and compressed air drives the flour dust out of every crevice.





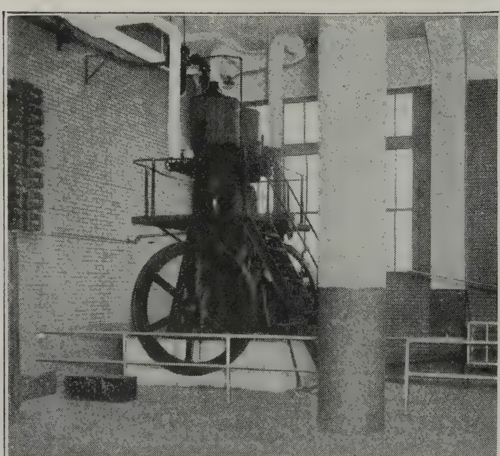
Dough Room

When the mixing process is completed the dough is emptied into large steel troughs on wheels, each holding half a ton, and set away in a special room to rise.



Air Washing and Humidifying System

All the air which enters the various rooms is washed and purified by passing through a continuous spray of water. This also adjusts the humidity of the air to just the right extent.

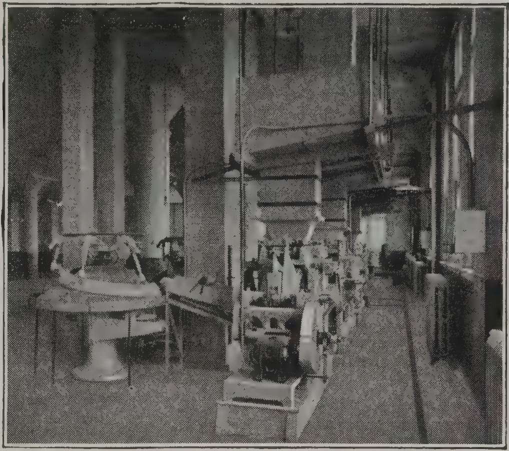


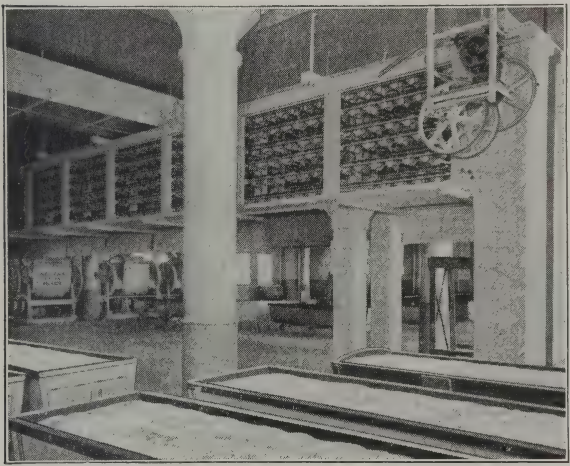
Refrigerating Machine

Regardless of weather conditions outside the temperature of the mixing and the dough rooms must be kept at a constant level. This refrigerating machine also cools the filtering water used in the mixing machines.

Dough Dividers and Rounders

Careful watch is kept on the dough in the steel troughs and when it has risen to the proper point, it goes to the automatc dividing machines (at right), which weighs out the precise amount needed for a loaf and neatly cuts it off and passes it to the rounding up machine (at left), which rounds it into a perfect sphere.



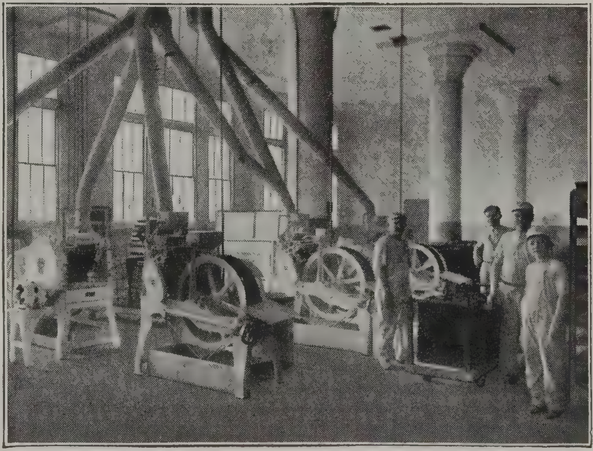


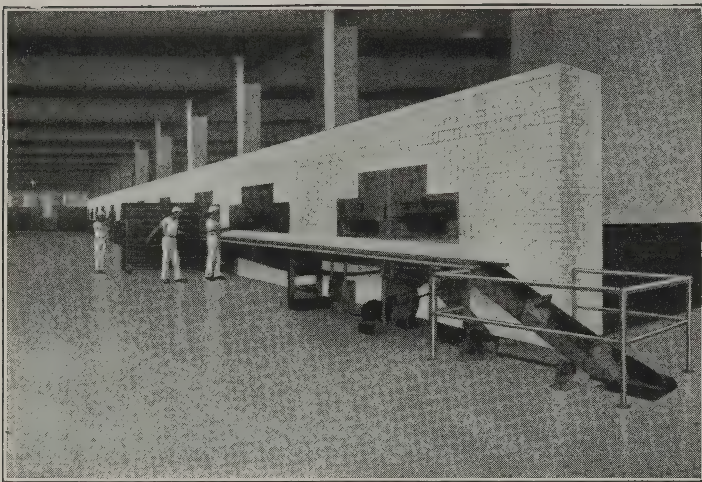
Automatic Proofer

This device gives the dough its proper "second rising." After leaving the dividing and rounding up machines each loaf in its own snowy white carrier rides back and forth in the carefully regulated atmosphere of the dough room for nine minutes.

Molding Machines

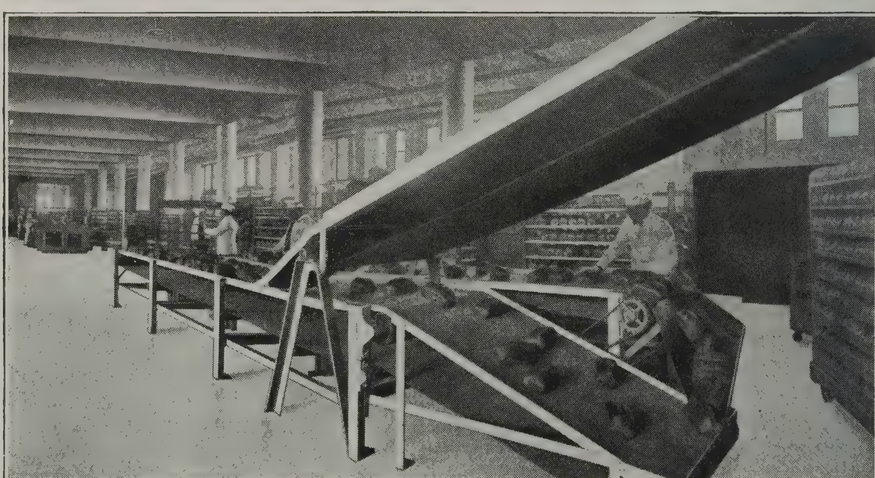
After its "second rising" the dough goes to the molding machines which form the bread to fit the pans. In the pans it is trundled away for its final rising in a room which is kept at 100 degrees. After this it is ready for the ovens.





Oven Room

The ovens are built of brick and the walls are made very thick, in order that they may hold the heat a long time. Sometimes the fire is permitted to go out for a day or two, but at the end of that time the bakers must still watch the bread very carefully or it will burn. Bread could be baked satisfactorily a week after the fires are out, so well do the brick walls hold the heat. Each oven will hold from three hundred to three hundred and fifty loaves of bread at one time. Each oven is illuminated by a powerful electric light in order that the baker may see all parts of it. Before the loaves are removed the oven is flooded with steam for a few minutes for the purpose of giving the crust of the bread the glossy appearance which we all like to see, and which the housewife secures, when she bakes bread in the kitchen range, by rubbing it over with butter or cold water.



Bread Room

As soon as the loaves come from the oven they are placed on an endless chain belt and carried to the bread room. In some bakeries absolute cleanliness is insured by wrapping each loaf. To do this an ingenious machine has been devised into which the loaves are fed as they come from the oven, and from which they issue completely wrapped and sealed, ready for the delivery wagon.

THE STORY OF A COAL MINE

Ages ago, before men were living on the earth, Mother Nature stored in the earth great quantities of valuable ores, such as copper, iron and tin, vast supplies of oil, and perhaps like a prudent mother foreseeing the needs of men, she was very generous in the matter of fuel supplies, and deposited such enormous supplies of coal that even with the most prodigal use it will be centuries before it is exhausted, and by that time we will probably discover some substitute. But just now it is hard to see how we could get along without coal.

Kinds of Coal

And you will learn another interesting fact about coal when you study those graphics. In finishing off the coal making process, nature used different degrees of pressure and the result is different kinds of coal. Where the surface was subject to great pressure in mountain making—as in Eastern Pennsylvania—a very hard coal was produced, known as anthracite. In the great majority of cases, where the pressure was medium, bituminous coal was the result. Do you have any bituminous coal in your state? In some of the western states, as you will discover, there are great quantities of low grade coal—shall we say only half finished?—known as lignite.

Coal Mines

There are many kinds of coal mines. In some places the coal exists in sheets or layers near the surface of the earth and it is only necessary to remove the thin layer of earth or stones to secure it. In other instances tunnels are driven into the sides of hills or mountains and the vein of coal followed up in this way. In the greater proportion of mines, however, the veins of coal are found at a considerable distance from the surface of the earth, and to reach them it is necessary to sink shafts, in some instances hundreds of feet. The walls of these shafts are lined with wood, masonry or iron plate.

Swift elevators to hoist coal and workmen go up and down this shaft. Generally there is another shaft for ventilation and safety at a distant part of the mine. At present the up-to-date mine is ventilated by blowing fresh air into it by electric fans. From the main shaft, the tunnels or roads branch out in all directions, and through them run tracks with cars drawn by compressed air engines, by electricity, or hauled by ropes or mules.

Improvement in Mining

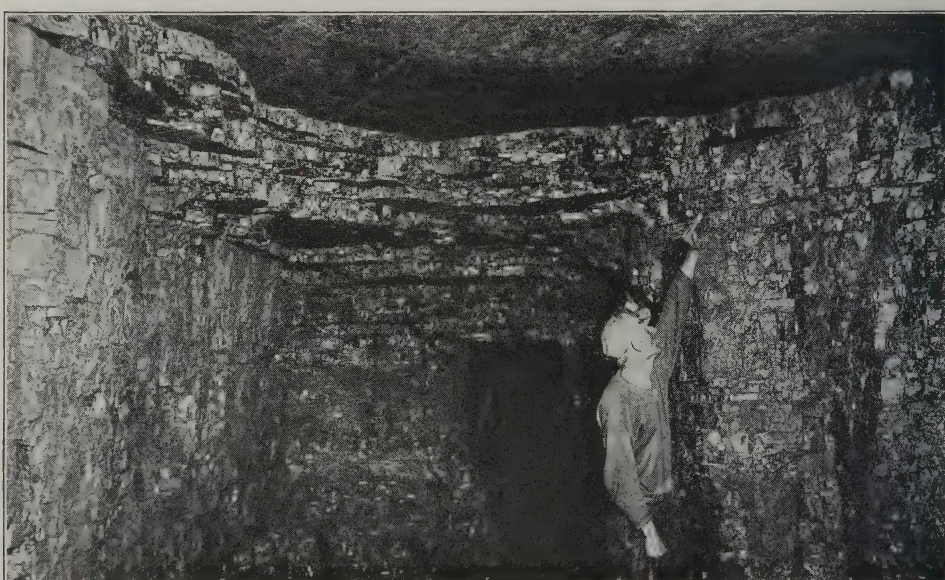
Improvements are constantly being effected in mining as in other labor fields. One of the greatest steps in advance has been effected by the quite general use of electricity. It is employed to run the high speed elevator, to provide power for hauling the cars, to light the passages, and to establish bell service from one part of the mine to another.

Our Picture Story

We have prepared the following picture story of operations in a bituminous coal mine. The condition would not be greatly different in an anthracite mine. See also p. 631 of the Home and School Reference Work for many interesting facts about coal.

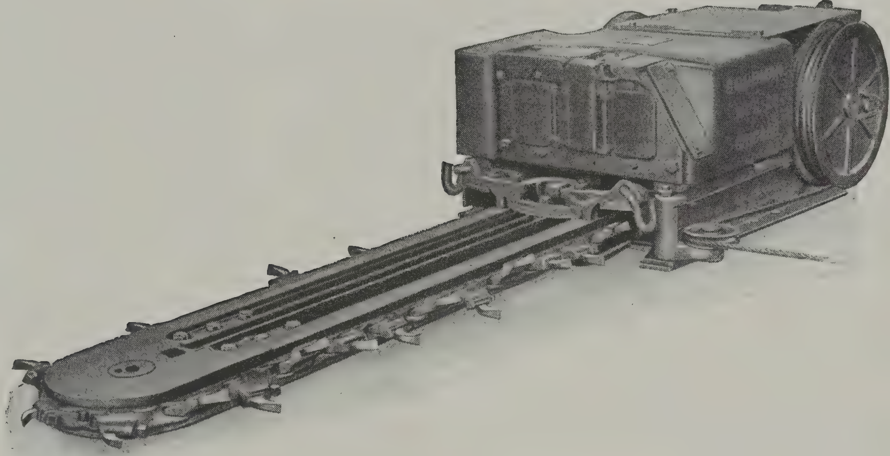
Modern Tipple and Washer

The tipple and power house are placed at the mouth of the shaft and contain the machinery for hoisting the coal and supplying light and power.



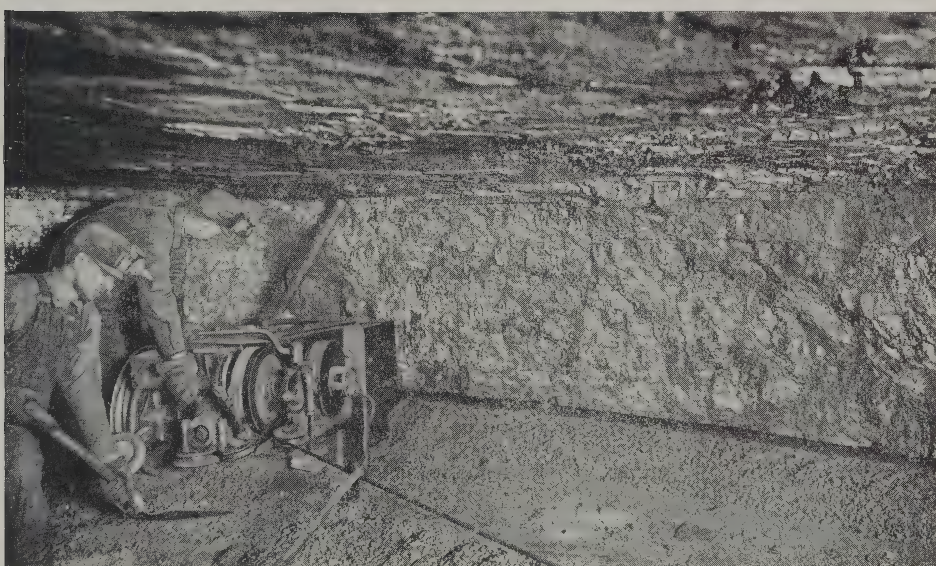
Vein of Coal

The height of the coal vein varies from a few inches up to several feet. In this illustration the vein is about nine feet thick but this is above the average.



Coal Cutting Machine

Machinery has largely supplanted hand power in a modern mine. This machine has a series of knives which cut a narrow channel under the coal.



Cutting Machine at Work

The machine has cut a channel deep under the vein of coal, several yards in length. The knives are arranged on an endless chain, driven around the framework as shown above. The roof is supported by pillars of coal left standing, or by timbers.

Power Drill

After the channel is cut underneath the vein, holes are drilled in the coal near the top of the vein. A light charge of powder exploded in the holes breaks the coal down in large pieces, suitable for loading on cars.

Fresh Air

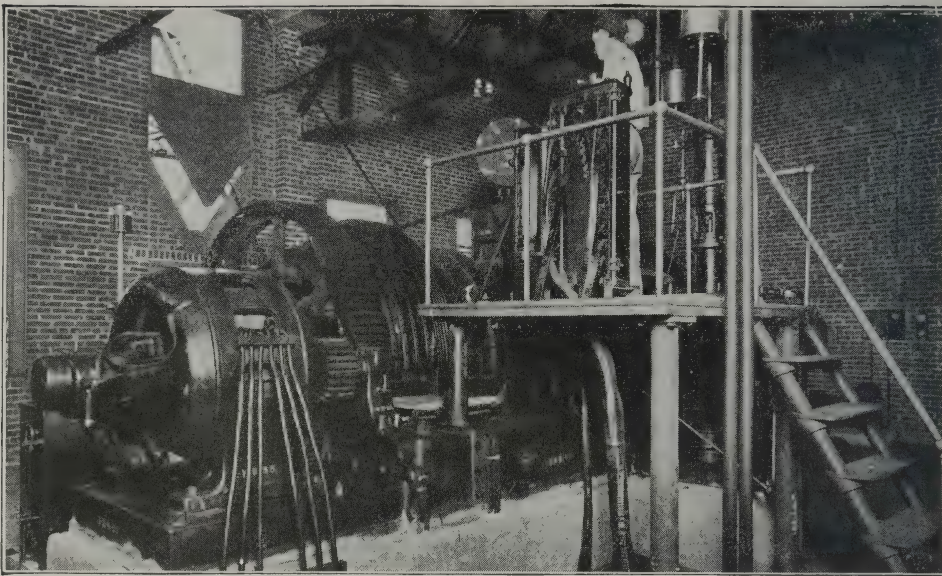
Fresh air is constantly being forced into the mine by this large fan. The explosion of the powder charges generates a large amount of smoke and gas which must be removed, and in some mines poisonous gases occur.

Hauling Coal

As the tunnels sometimes run for miles some method must be found for pulling the loaded cars of coal to the shaft. Formerly mules were used but now electricity is commonly employed.

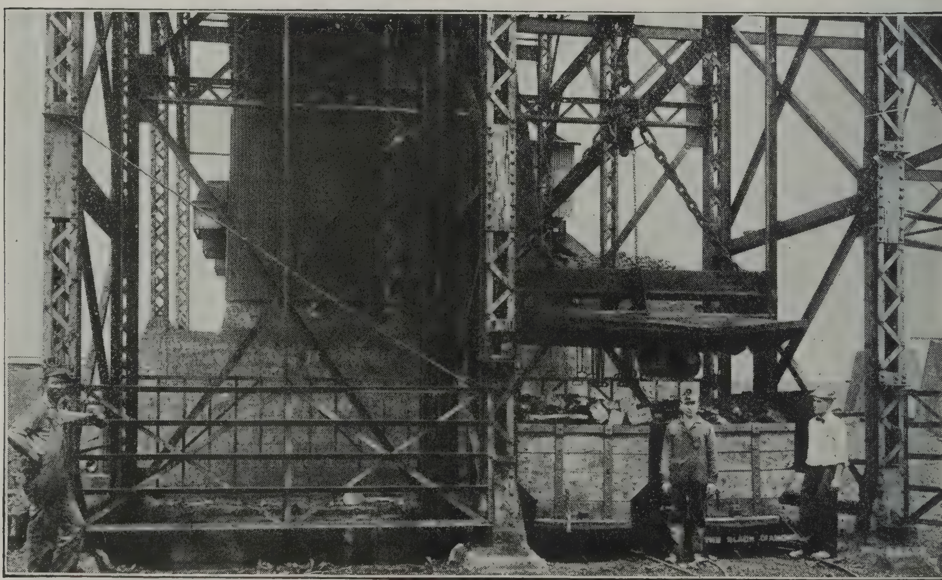
Bottom of Shaft

The tunnels at the bottom of the shaft are sometimes quite large, and the roof is strongly supported. Lumber, and to an increasing extent cement is used for these supports.



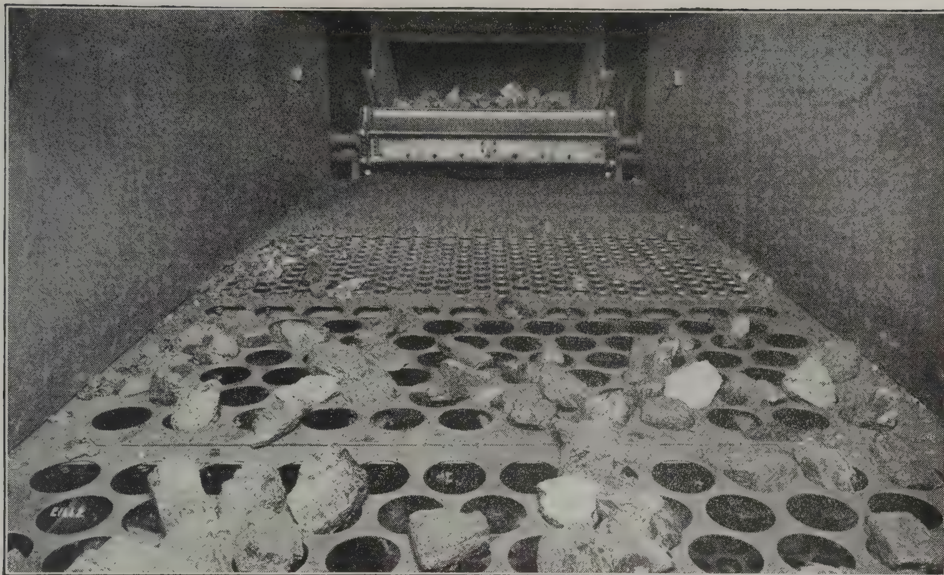
Power Hoist

The cars of coal are elevated and the miners raised or lowered by elevators attached to long steel cables, which wind and unwind on large drums. Either steam or electric power is used.



Top of Shaft

Two cars of coal have just been brought to the surface, while two more are being loaded on at the bottom. Safety gate prevents anyone falling in open shaft.

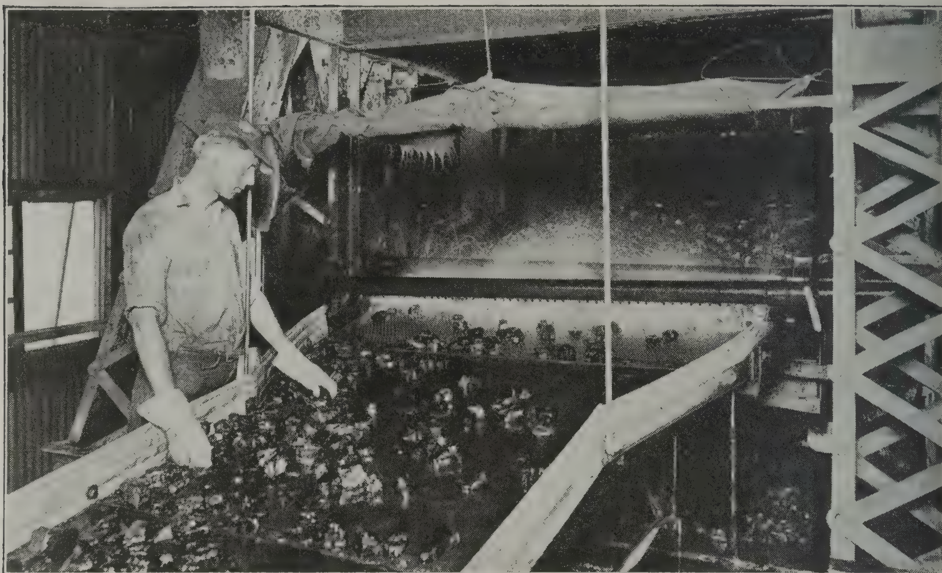


Screening Coal

Various sizes of coal are best suited for different uses. At the fore end, where the coal enters, the screen has only fine holes which permit only very fine coal to pass. The holes gradually increase in size. The screen constantly shakes, giving a forward motion to the coal.

Conveying Coal

Coal is economically carried from the tipple to the washer by means of a large wide belt, which by a series of rollers set at an angle, has its edges raised so that the coal will not fall off.



Washing Coal

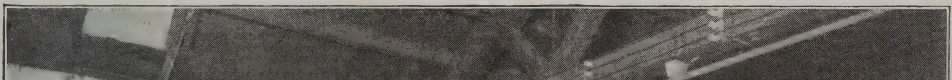
For domestic use and certain other purposes washed coal is more satisfactory. By passing a thin layer of coal through a spray of water the dust and other impurities are removed. Not all coal is washed.

Picking Coal

Slate and other foreign articles are picked out, usually by hand. For this work some mines use spiral plate packers, which throw out the slate by centrifugal motion.

Loading Cars

After being washed, picked over and graded the coal is ready for loading on the cars, and is conveyed hither through chutes. If the coal is very soft and easily broken, long chutes which reach to the bottom of the car are used.

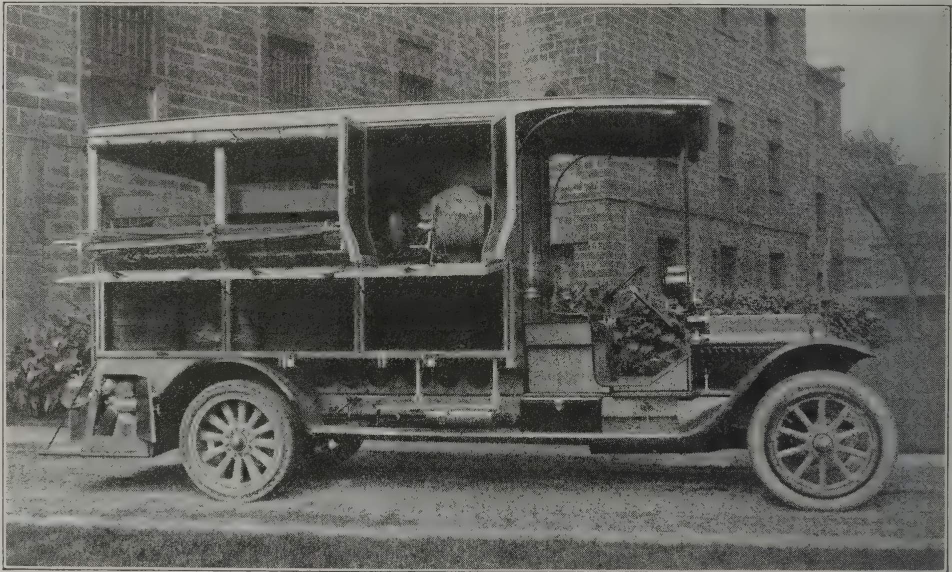


Electric Plant

A great amount of power is necessary for lighting the mine, pulling the underground cars, furnishing fresh air, hoisting the coal, and the operations of the tipple and washer. Many mines have their own complete electric plant.

Rescue Cars

In some mines gas exists, and though explosions do not often occur, still they sometimes happen. The Bureau of Mines maintains a number of special cars fitted out with life saving apparatus which are sent to any mine where an explosion has occurred, and have been the means of saving many lives.



Motor Rescue Trucks

Similar to the Rescue Cars, but more mobile. Note stretchers, windlass, ropes, pulleys, oxygen tank, fire extinguisher, and trunks of first-aid boxes.

Volunteer Rescuers

An accident has just occurred and these brave volunteers are searching the debris for the dead and injured. A canary bird is overcome by gas much quicker than a man. These men are watching the bird carefully, knowing that as long as it breathes freely they are safe.

Rescuers Entering Mine

These rescuers are equipped with oxygen breathing apparatus which enables them to stay in poisonous gas for two hours. They carry a canary bird.

THE STORY OF CORN

The probabilities are that in your state corn is a very important crop. It is grown in every state of the Union, and is by far the most important crop raised in the country. The value of the 1917 corn crop was considerably over four billion dollars. You are no wiser when we mention that sum. It may help to a slight comprehension to reflect that there has not been that many seconds since the Declaration of Independence. The corn crop that year would have filled a crib 8 feet wide, 8 feet high, and so long that it would reach around the world at the equator.

What We Do With Corn

If you will turn to page 710 of the Home and School Reference Work, you will note that nearly all our starch comes from corn, the glucose comes from the same source, paper and twine are made from the leaves and stalks. The husks are used for packing purposes, for the stuffing of mattresses and couches. The cobs are extensively used in the manufacture of pipes and also for fuel. The pith of the stalk is used in construction of battleships, also to make high explosives. A medicine is extracted from the silk, and from the smutted ears, and we know that corn furnishes food for man and beasts.

Where Corn Is Grown

About three-fourths of the total corn crop of the world is raised in the United States. It is also raised in South America, especially in Argentina. It seems strange to read that millions of bushels are imported into our country from Argentina. It is also grown in Southern Europe quite extensively, in Asiatic Turkey, China, and in parts of Africa. While grown generally in the United States, yet in what is known as the corn belt of the Mississippi Valley it has been most extensively raised, but with improved methods of cultivation the old corn belt seems to be rapidly extending its bounds South and West.

Possibilities of Corn Raising

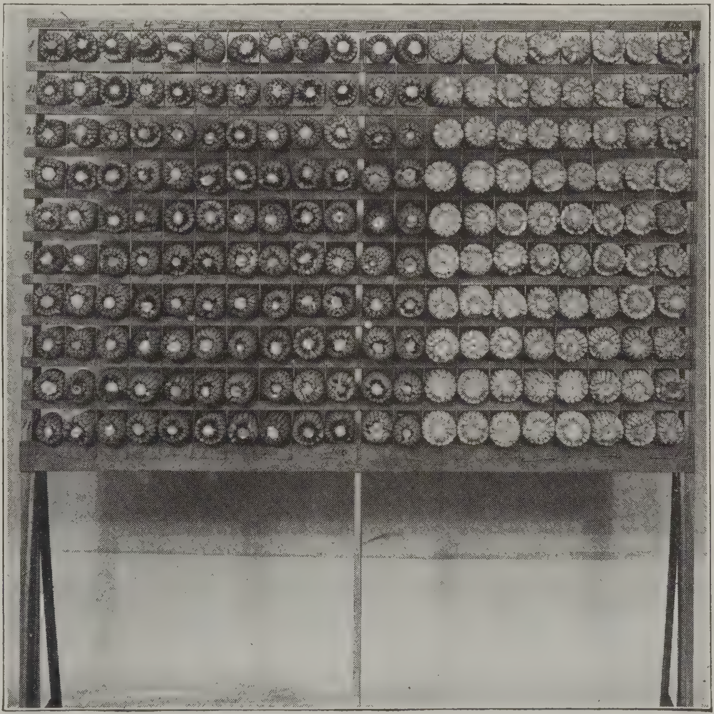
The total amount of corn raised is indeed vast, yet the average yield per acre is small. The 1917 crop averaged less than 27 bushels to the acre. The corn club boys have shown that under efficient means of cultivation, careful selection of seed, that the average production can be doubled easily. In effect that is doubling the value of the land. The great war has taught us with startling emphasis the value of food; civilization itself is seen to depend upon proper supplies of food. The population of the world as a whole is rapidly increasing. Especially is this true of the United States, and from this the great importance of the story of corn and how to improve it is clear.

Improving the Corn

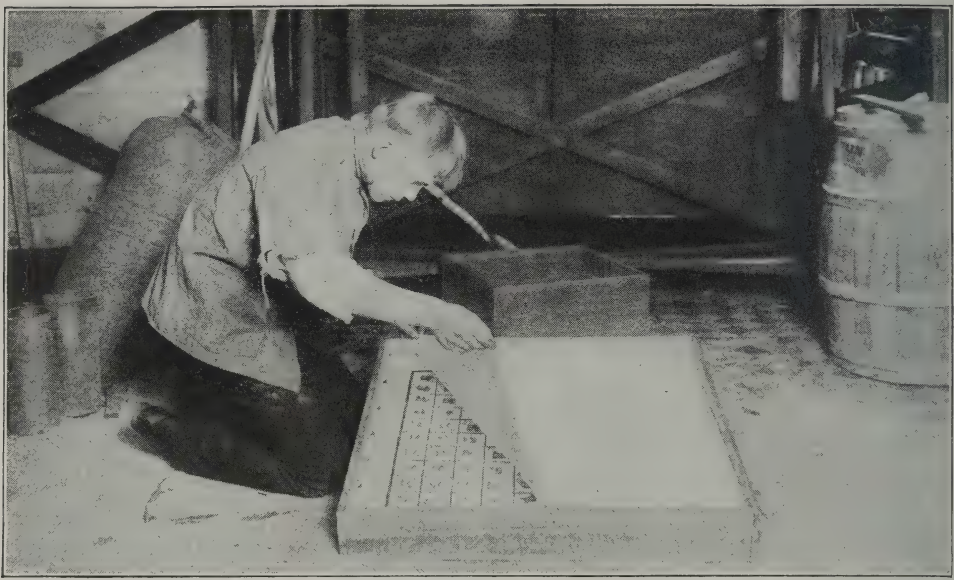
It is regarded as certain that in the long course of time Mother Nature developed the original variety of corn from a rank growing forage plant in Mexico, but that primitive people early assisted nature in this work and we have only recently learned how to assist most efficiently in this work. In this work, the corn club boys are nature's first assistants. They have a right to be proud of their record. Now, you may not belong to such a club, but we are sure you will be interested in learning how the best seed can be selected and note methods of cultivation.

Attention must be paid to the corn stalk from which the ears are selected. The stalk should be of good size at the base, gradually tapering, not necessarily tall. Largest, best formed, and to a large degree the earliest maturing ears will be found at a medium height. The shank of the ear should be of medium size, and of sufficient length that the ear may hang with tip down. The husks of the ear must not be too heavy. If nearby stalks be barren or dwarfed reject the ear, for the ear may be affected by pollen from the poor stalks.

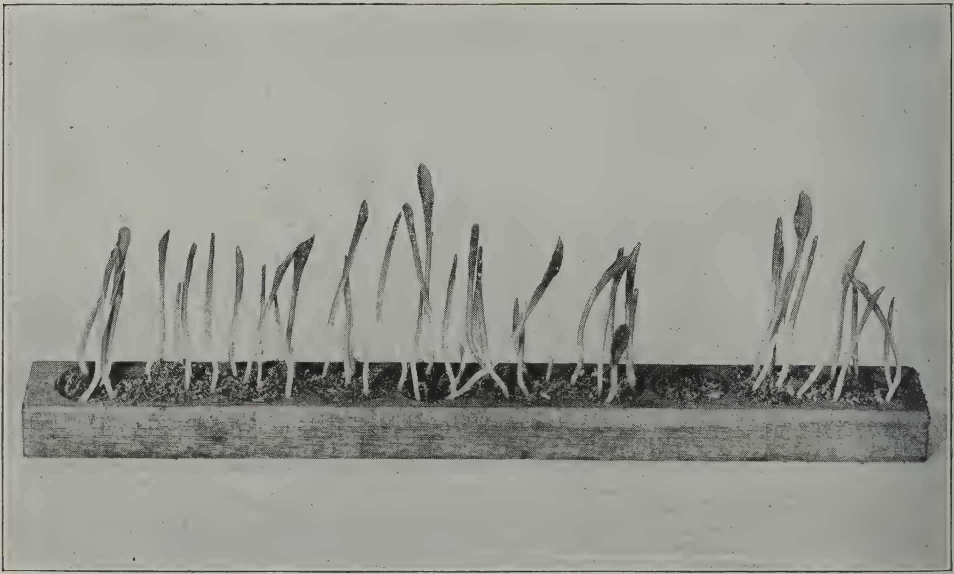
The ear should be thoroughly mature, show no sign of weak vitality, be from eight to ten inches in length, tapering gradually from butt to tip. The top should be well covered with kernels that are dented rather than round, and shot shaped, the kernels at the butt should be uniform in shape and fit closely about the depression at the end of the cob. The rows should be straight and free from depressions. The kernels should be keystone shaped, of medium depth with large germs.



Seed corn that has been husked requires just one thing. Each ear must have access to a complete circulation of air in order that its excess of moisture may evaporate rapidly enough to prevent fungus growth and chemical changes in the kernel. Of course such a storage place must be dry and free from raids from mice and rats. There are several different methods. Notice each ear is by itself in a numbered cell.



This boy is testing the germinating power of his seed corn. You recall that each ear was in a numbered cell. He has prepared a seed box, in squares corresponding to the numbered ears he has placed kernels from each ear. There is a layer of moist sawdust underneath the kernels with a strip of muslin between. There is another strip of muslin over them with more sawdust.



In this tester the principle is just the same. The corn has been growing several days. One can easily decide which are the good seed ears.

To break the soil apart and make it loose and mellow the plow is used. On large farms in the West, farm tractors capable of plowing many acres a day are used. The disk and harrow are used to pulverize it properly. Sometimes the fields are rolled.

At present some form of a planter is used in seeding the fields. Checking is the method most generally used. In this form of planting, the corn is planted in hills that form rows either way.

This is a modern corn picker and husker. Where the corn stands up well, and the rows are of good length, this machine works well. The usual method is to hand pick and husk, throwing the ears into a wagon.

Preparing corn for winter feeding. There are various forms of shredders and cutters used. Corn intended for silage should be cut after the grain has passed out of the milk, before quite ripe.

THE STORY OF SILK

Mother Nature gave her various animal children scales, feathers or fur to protect them from the elements in which they lived. But when man appeared she seems to have said, "I have given you brains. I will see that plentiful supplies of raw material are provided, but you will have to discover how to prepare the material for use. It is up to you." So man has been at work for long centuries, and the result is the clothing that people are wearing today. Suppose you question the different articles you wear. Where did your shoes come from? Some of your garments are cotton, some of wool. You know their origin. Any linen? Can you tell its origin? And now are you wearing anything of silk? If not yourself, we are certain you know that many articles are made of silk. We have prepared a pictured story of silk. We will ask you to read the article on silk in your Home and School Reference Work, p. 2648. Yes, our silk is made from the cocoons of a worm, that he spun for a home when passing to the moth form.

The Origin of Silk

Silk can be traced to China, where some thousands of years ago patient workers began to study the silk worm, and experimented with the cocoon, learning how to reel off the threads, prepare them for use and finally to manufacture many articles. All sorts of mythic stories have gathered around this first stage of silk manufacturing in the long ago. The details of this work are gathered from compilations made by the Chinese government of early notices and rules pertaining to silk culture, paintings on antique porcelains, and quaint wood cuts by ancient Chinese artists. This industry was considered so important that it was connected with religious rites. Efforts were made to safeguard their secret, and the penalty for taking eggs of the silk worms out of China was death.

Introduction Into Europe

But such important discoveries cannot long remain the property of one people, and an interesting account is given of the introduction of silk cultivation into Europe in the reign of Justinian. A very celebrated painting represents two monks presenting Justinian silk-worm eggs and mulberry branches. The eggs had been secreted in hollow bamboo staffs which the pilgrims carried. This was more than a thousand years before the discovery of America, when Constantinople was the capital of the Eastern Empire of Rome. Nearly five hundred years later the Moors from Africa introduced the culture into Spain, at that time the most enlightened country in Europe.

Introduction Into America

Attempts were made to introduce silk culture into Mexico by the Spaniards, later by the English in the early colonies. A promising beginning was made in Connecticut. Governor Low of that colony wore the first coat and stockings made from New England silk in 1747, his daughter wore the first silk dress in 1750. The first silk mill was erected in Connecticut in 1810, and near that same place, Manchester, Connecticut, are great factories devoted to that purpose. Other great works are located in Massachusetts at Florence. Also consult the state graphic of New Jersey. In China, labor is very cheap. In this country we have had to invent many ingenious machines to do the work of hands in other countries. As always it is brains that tell, and the story of silk is most interesting.

Excepting the last two cuts in this story of silk the illustrations are copyright by the Corticelli Silk Mills.

This illustration is evidence of the care the Japanese government bestows on silk worm culture. The moths are laying eggs on regulation papers, and these sheets will be inspected by government officers. All eggs deemed unhealthy will be destroyed. For centuries an effort has been made to improve, by judicious selection the silk producing power of the worms, and on comparison it is seen that the cocoons of the domestic worms are much larger, and the fibers of a finer quality, than the cocoons of the wild silk worms that have never been brought under the care of man. The moth has also lost the power of flight and has become white in color.

The egg of the moth is nearly round, slightly flattened and resembles a turnip seed. When first laid it is yellow, but soon turns a gray or slate color. It has a small spot on one end through which the baby worm gnaws a hole when he is fully formed. He is black in color, about one-eighth of an inch in length,

Securing the Eggs.

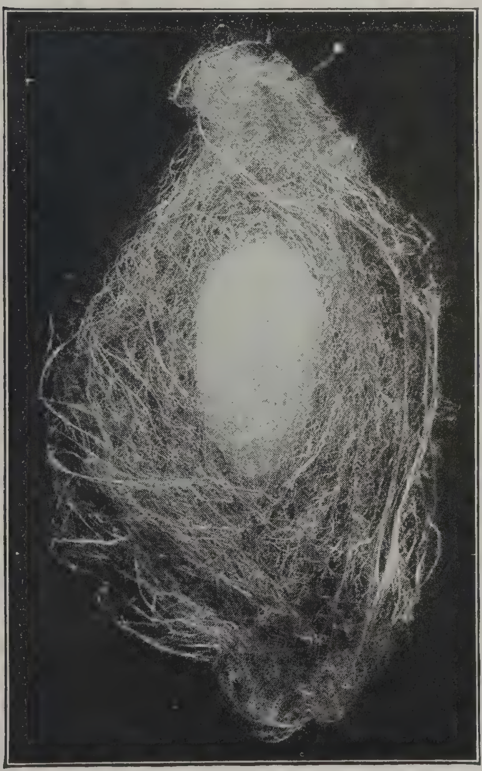
covered with long hair and is unusually well supplied with legs as he has sixteen in all. The Japanese experts can tell from the appearance of an egg whether it will produce a healthy worm.

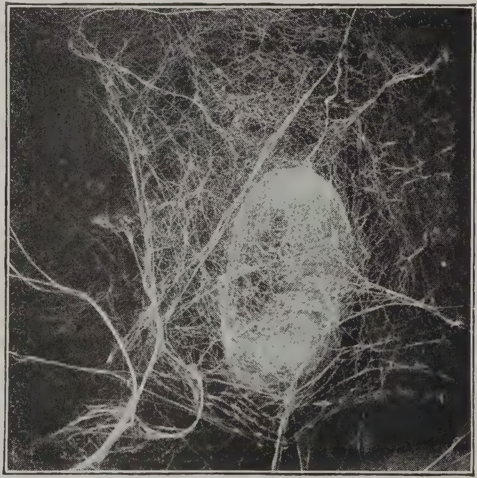
Owing to the high prices of labor the United States cannot compete with Japan, China and Southern Europe in the production of raw silk and we import our supplies, but having invented machines to replace hand labor we can manufacture silk successfully.

It is interesting to remark that the tiny silk worm can secrete the strongest fiber known to science, that is, relatively speaking. It is the only fiber that can resist decay caused by dampness. Cotton will soon mildew and waste away when exposed to continued dampness but silk is apparently proof against such decay; the silk fiber may even be soaked in water without imparing its strength.

On this page, different stages of cocoon formation are illustrated. The main business of the worm during the first days of his life is eating, growing, changing his coat, or molting. He is about three weeks old. The coat he is now wearing is the fourth one of the series. During the coat changing time, he suspends eating, but makes up for lost time by more vigorous efforts. In addition to growth, he has stored up material to make silk. Instinct now prompts him to spin a protecting cocoon in which to effect a change to a moth stage. You all know what a cocoon is for you have seen cocoons of other worms stuck around on bushes and trees.

He is a faithful worker, and in twenty-four hours he has thickened





the thin, gauze like network until he is nearly hidden from view. But it is not completed.

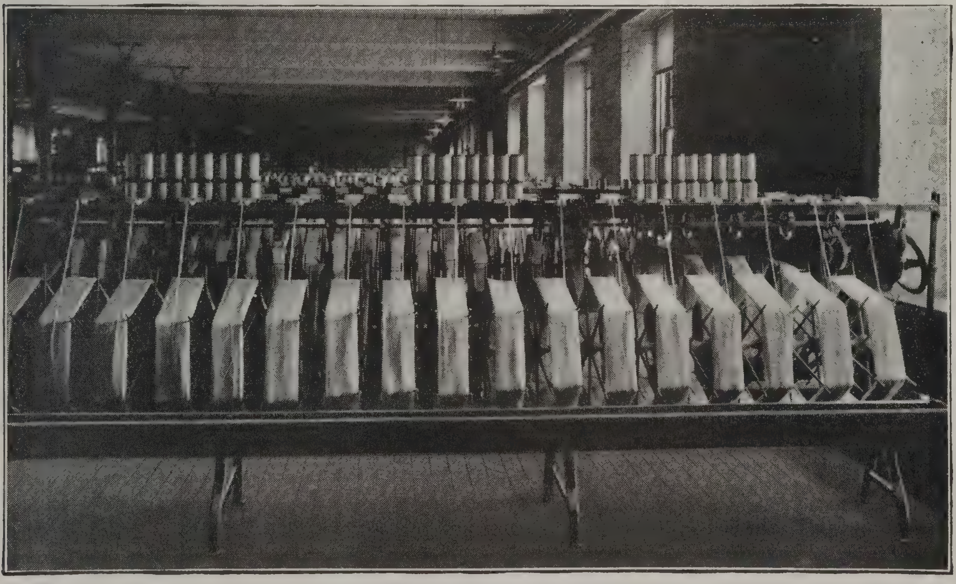
In the third illustration the cocoon, or temporary home, is completed. It is this cocoon that we are going to unravel and turn into silk. The worm interests us no further, and as a reward for her faithful service nature is soon to set her free as a moth to live a few days as a flyer and then lay eggs for future use.

These illustrations show us methods of reeling silk, or unwinding the thread from the cocoon used in household production in Japan, also in Japanese factories. After the cocoons have been spun, they are gathered and exposed to dry hot air which suffocates the worm. They are then placed in basins of hot

water. The operator brushes the cocoons with a small broom, the loose fibers attach themselves to the broom. They are carefully unwound until only one thread appears. The threads from several cocoons are united in one and wound off on a reel. This reeled silk is put up in skeins and is ready for shipment.

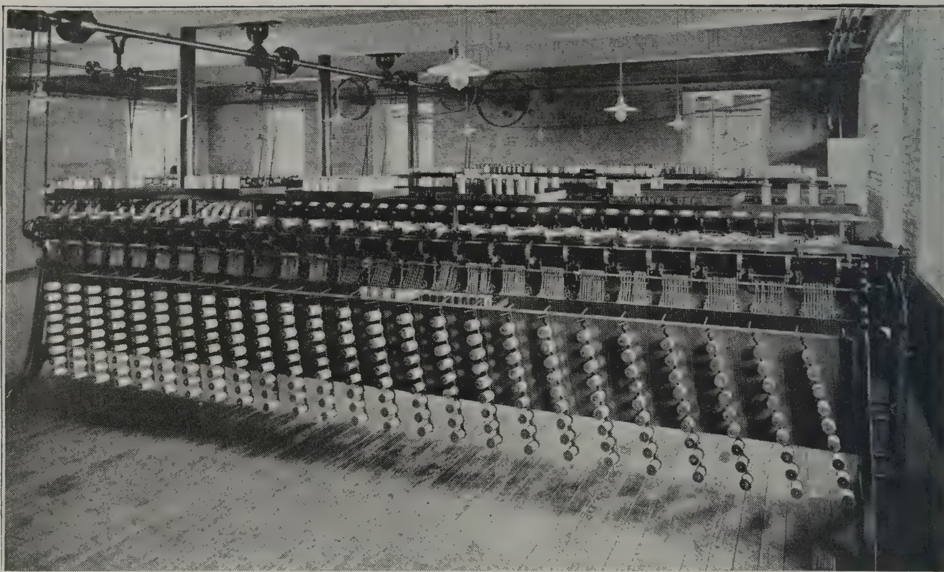
The Drying Rooms

Arrived at the factory, the skeins are sorted, graded, put in canvas bags, and then soaked in soapsuds to soften the gum. Afterwards the skeins are straightened out and hung on poles in a steam heated room as shown in this illustration. When dry, they are removed to the winding room.



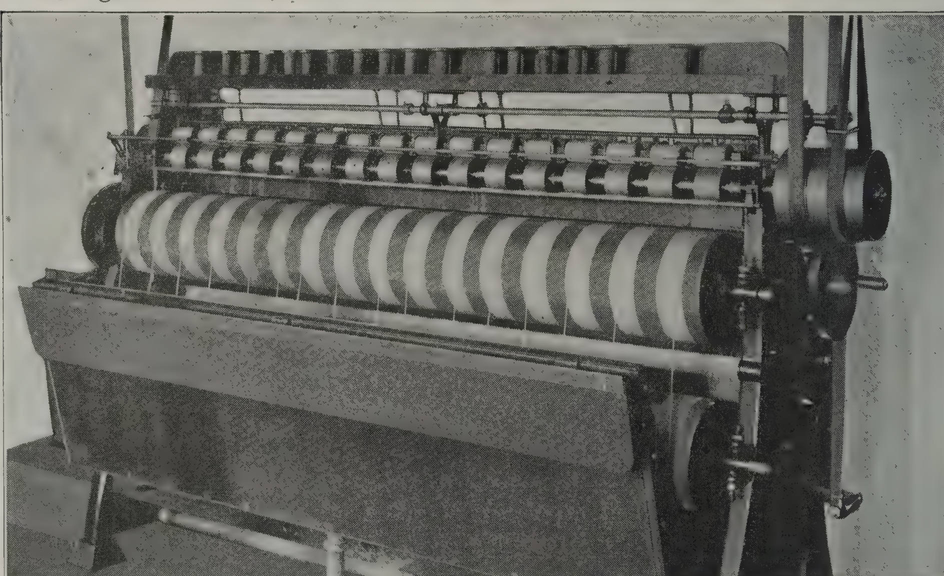
The Winding Room

You notice the skeins on the frames, the silk fiber is being wound off the frames on large spools or bobbins.



The Doubling Machine

These bobbins are next placed in position on the doubling machine. The purpose is to combine the threads from several bobbins into a single thread, according to the thickness desired.



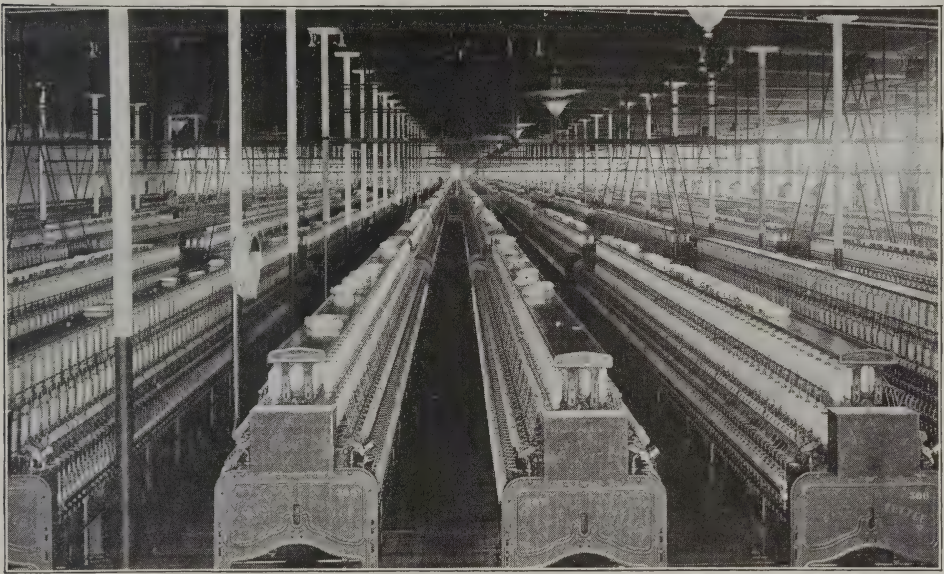
The Water Stretcher

The next step required is to stretch the threads. The bobbins are placed in water and the silk is wound on the lower of these two rolls, from thence it passes to the upper roll, which turns faster and thus stretches the thread.

The Ring Spinner

The Ring Spinner is the final step in the evolution of spinning, and it will be interesting to read the articles on Spinning and Spinning Wheel in your Reference Work. Spinning is simply twisting any long roll of fabric, it may be cotton, wool, silk, or even paper, so as to form a thread or a yarn string according to the tightness of the twist. If you will take a tape of tissue paper, say a foot long, two inches wide, and, beginning at one end twist it round and round, you will make a cord or string of considerable strength. If you have twisted it tight you may not be able to break it easily. All processes of spinning result in similarly twisted threads of what were originally loose fibers of cotton, wool, flax or silk. This is a necessary process before cloth can be woven.

Many centuries of slow advances have culminated in machines represented in this illustration. Its immediate predecessor was a frame alternately advanced



and receded from a row of bobbins prepared in the roving frame. In these machines you note the bobbins prepared as we have just described on the top. The rovings on the bobbins are the partially twisted tape threads, now to be twisted by most ingenious machinery into a strong thread.

Notice carefully and you will see that rovings from two bobbins are being united into one thread. That thread is being spun, that is, twisted by a marvelous mechanism that makes thousands of revolutions a minute, at the same time drawing the thread out. The finished product is being wound on sprindles shown below, by means of a mechanism known as a traveler that travels around the spindle, so the whole arrangement is called a ring spinner.

It represents the final stage of development, through many intermediate forms, of the spinning wheel, once considered a necessary part of every home equipment.

Dyeing Silk

Of course the thread must be dyed. The dyeing process is a very important one, and upon its success depends the permanency of the various colors. The dye house is a model, and the results that come from it are the achievements of years of scientific investigation and experimenting. Vast tubs, tanks and kettles surround you on every side, and the hissing steam seems to spring from all quarters. The "gum" of the silk is first boiled out of immersion in strong soapsuds for about four hours.

Before dyeing, the silk may be soaked in Mordants, that is, some fluid that serves to fix colors, this is not as necessary as in the case of cotton yarn for silk has a natural affinity for dyes.

You notice in this room workmen are dipping skeins of yarn into vats containing the coloring material. The dye is kept at the right temperature by ma-

chinery. In some mills the dipping process is done by machinery. After dyeing the skeins are to be freed from moisture. This may be done by hand. The skeins are being hung over pegs in the wall, then wrung as much as possible by turning a smooth stick, run through the other end of the skein. If machinery is used the water is thrown out by centrifugal force. The dyeing process gives luster as well as color to the yarn.

The Dye House

We have thus far been considering the making of silk thread and the illustrations have been kindly furnished by the Corticelli Silk Mills, and now whenever you notice spool silk in your homes, reflect that before you is the finished product of fibers of the tents, so to speak, of one of Mother Nature's lowly forms which he wove to furnish him protection while passing through that mysterious stage of evolutions from which he was to emerge a fluttering moth.

Weaving Silk

Making silk fabric is as interesting a story. Not all the silk received at mills is in the shape of reeled silk, it is in the form known as waste silk. Silk from cocoons that cannot be unwound, and from pieced cocoons, that is cocoons from which the moth was allowed to escape so as to lay eggs from which other silk worms would hatch, for the worm is our indispensable fellow worker in the silk making process. This silk must be spun into yarn, a process analogous to weaving cotton or wool into yarn.

The waste silk is first boiled in soapsuds to remove the gum, and then dried and run through rollers which pull the fibers into sheets. After several cleaning, combing and inspecting processes, the silk goes to the spinning room where

the fibers are straightened, and after going through numerous machines comes out as spun silk. The skeins of spun silk are dyed, though some silks are dyed after being woven into cloth.

The first stage in weaving silk is to prepare the warp, which consists of the long, strong threads that run lengthwise in the goods. This is a very tedious process which must be done mostly by hand. Each thread must be run through an eye, and it must be done absolutely correctly, for if a single thread is misplaced it will show throughout the whole piece of cloth.

The weft or woof, the threads which run crosswise of the goods, is wound upon a quill, so called from its shape, which is placed inside a shuttle which will let the weft unwind as fast as the shuttle flies.

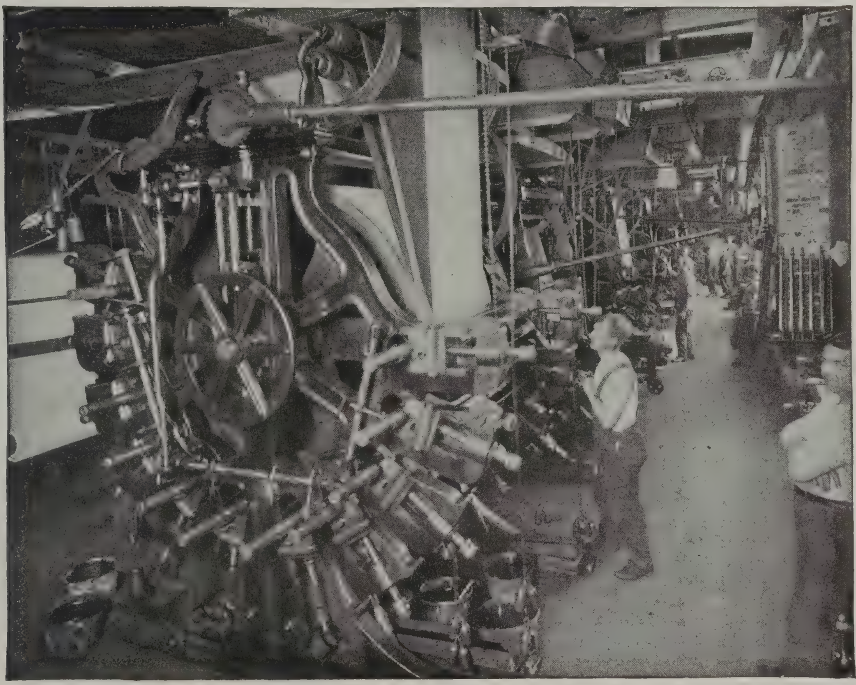
The Weaving Room

The first thing that strikes one on entering the weaving room is the resounding racket, like a constant rattle of musketry. Silk weaving is still far from automatic. The weaver must keep the shuttle filled, clean the warp, keep the threads straight, drive the shuttle flying through, push against the woven goods to crowd the filling into place, lift the next set of warp threads, let the warp off its beam as required, and take up the woven goods. Velvets are now woven into two pieces, face to face, with threads running between them, and as fast as woven are cut apart by a sharp knife, which leaves the pile threads standing up.

A Jacquard Loom

You perhaps have seen a Jacquard loom at work. It is a marvelously effective machine. You have noticed the rows of differently colored spools of silk yarn, and it is weaving a pattern of many colors. We can give you an idea that will help you to understand it. You have seen a record being played on a player piano? You know on the record there are arranged a succession of openings that permit just the right key to be sounded. In a Jacquard loom, the design is put in the shape of a record and little hooks pick up just the right thread when its opening is presented.

If the silk has not been dyed before weaving it must now be done in the piece. Many fabrics are woven plain and afterwards a design is printed upon them. This involves other arts, such as designing, engraving and color mixing. The process is the same as that employed in printing calico, but naturally the process is more delicate. The dyes employed were formerly largely imported



Printing Silk

from Germany but as a result of closing that source of supply we now manufacture the dyes in this country. Finishing process follows the printing to make the silk pleasing to sight and touch. At last the silk is ready for the packing and shipping room.

The Weaving Room and Printing Room illustrations are furnished by the Cheney Brothers.

THE STORY OF COTTON

Cotton is one of the most valuable of Mother Nature's gifts to man. From its fiber we make clothing for the body and high explosives to protect our country in times of war. From the seeds we extract valuable oil, largely used in cooking and from it many grades of soap, candles, glycerine and other articles are manufactured. From the seeds also we manufacture a most nutritious food for animals, and a valuable fertilizer. So valuable has the seed become that it is bought and sold in markets as grain. It is asserted that cotton would be a valuable crop for the seed alone.

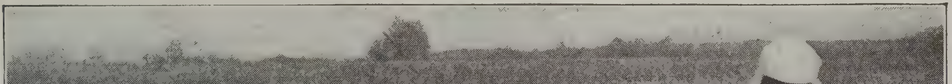
But the great value of cotton is the fiber from which we manufacture cotton fabrics. When one considers the immense amount of cotton material used for

The Cotton Plant—Some of the Bolls Are Opening

home purposes, its vast importance becomes manifest and its manufacture. This is one of the great industries of New England and our Southern States.

Cotton does well in comparatively limited sections, though widely scattered in warm temperate and torrid lands. The far larger portion of the world's cotton crop is raised in the United States, but its cultivation has been rapidly increasing in other lands, as South America, Africa, and China. Like iron, the world is demanding constantly increasing supplies and there is no danger that too much cotton will be raised. We have arranged a pictured story of this important crop and its manufacture. As preliminary, read the article on cotton in the Home and School Reference Work, beginning on page 719.

A field of cotton in bloom when the stand is good, is a very pleasing sight. The plant itself is a small bush from two to four feet high, the lower branches more widely spreading than the upper ones.



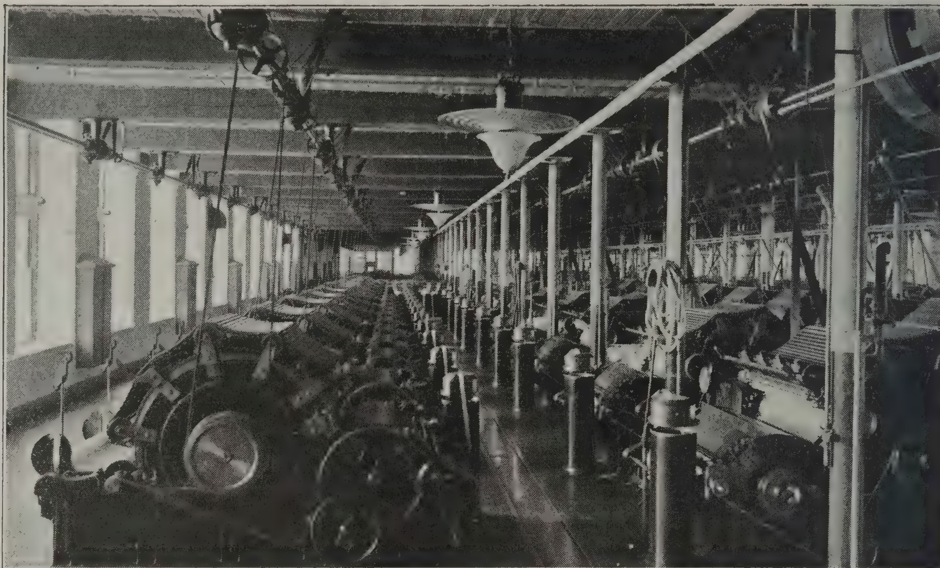
The real flower is not unlike a small hollyhock flower, since the two flowers are cousins, so to speak. Each flower forms a capsule or boll. Within the bolls are the seeds, attached to a dense covering of fine white fibers. When the boll opens the cotton is ready to be picked.

When the cotton is first picked the seeds are still attached to the lint. These wagons are delivering seed cotton to the gins. It will be interesting to consult the article Cotton Gin in your Reference Work.

After the seed is separated from the lint, the latter is baled. Notice the cotton bales in the yard of this compressor. If intended for export, the cotton is here rebaled, under great pressure. It is now ready for shipment.

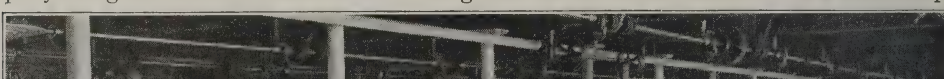
The compressed bale cotton is almost a solid mass of cotton, in it are imbedded pieces of leaves, seeds and much dust and dirt. It must be torn apart, cleaned, dusted, and arranged in a filing lap and different grades of cotton must be mixed. We have represented two of the machines of this process. Notice the

chunky dirty cotton of the first illustration, finally appears in rolled laps of clean, white filing cotton. Something like gigantic rolls of absorbent cotton that you buy in drug stores.



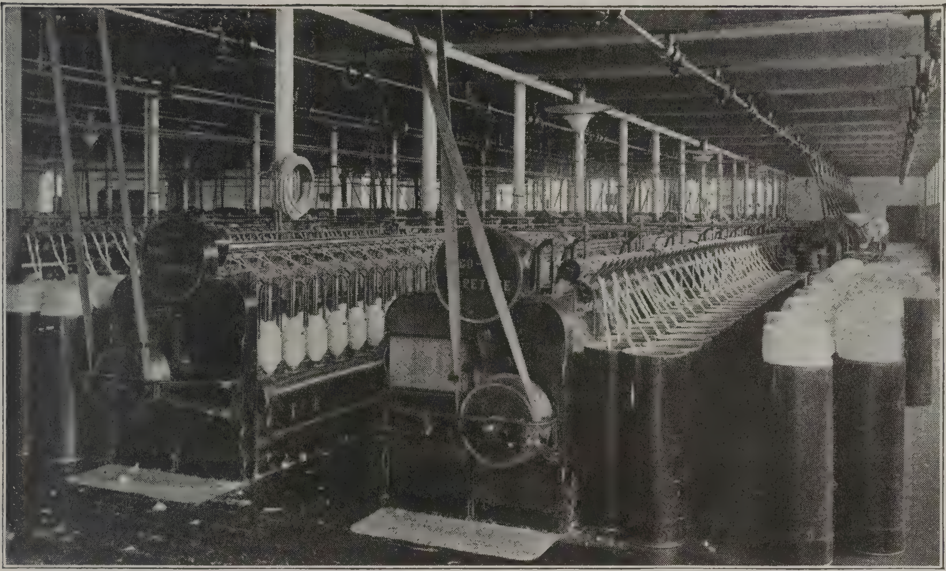
The Carder

This line of machines is composed of carders. Notice a roll furnished by the foregoing process is being fed in at the left. The covering on the top of the machine and the revolving cylinder are covered with cloth in which are arranged projecting wires. The result is to arrange the fibers of the cotton in the rolled lap



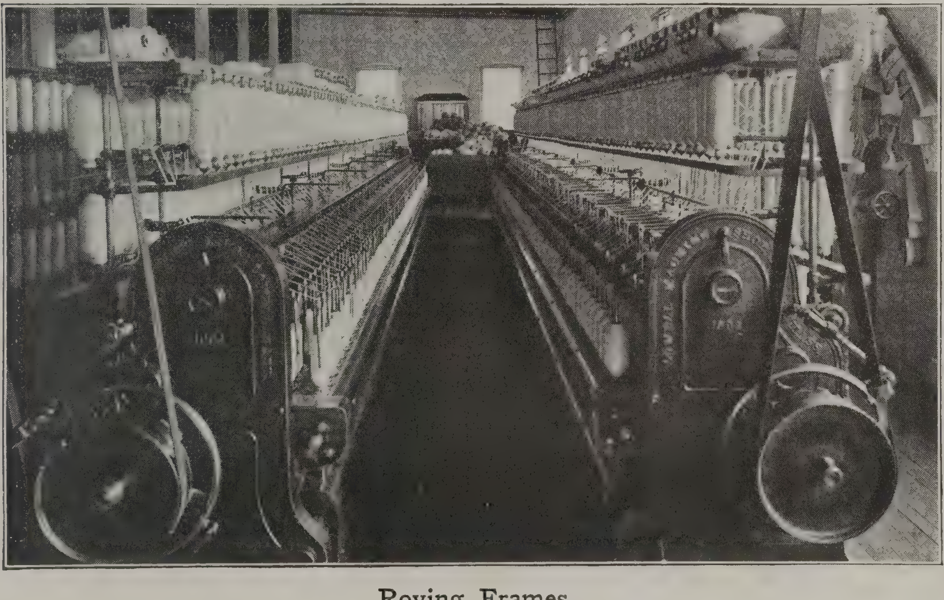
Drawing Frames

parallel. When that is done, they are in a tape form known as slivers, and are arranged in cans. In this drawing frame, six slivers are united in one and drawn out into a cord, but not yet twisted.



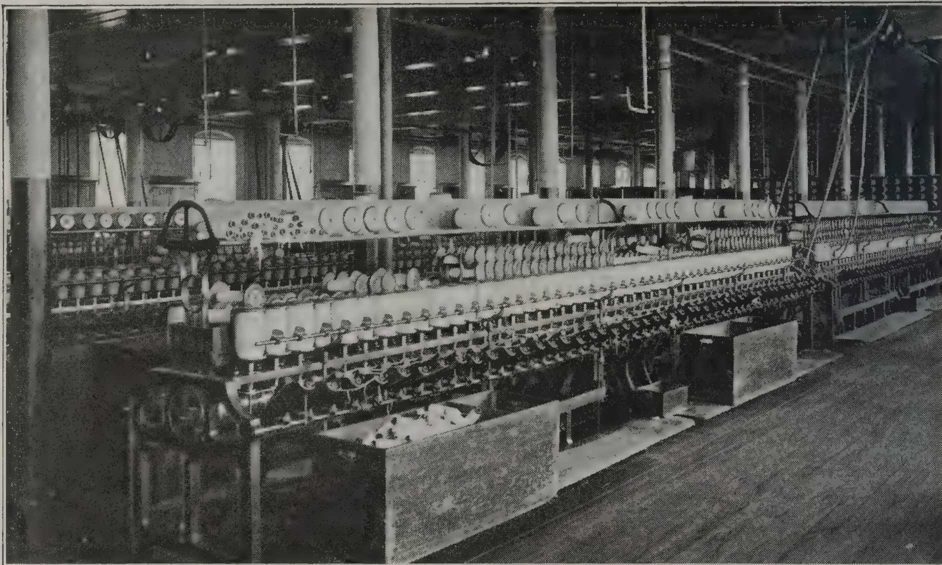
Slubbing Machine

Both of these machines continue the process begun in the drawing frame. The resulting sliver from the drawing frame is still further drawn out and



Roving Frames

wound on bobbins. Please notice them. It is now called a rove and in the roving frame it is again drawn out and slightly twisted, and in this machine two rovings are united in one. It is now ready for the spinning room.

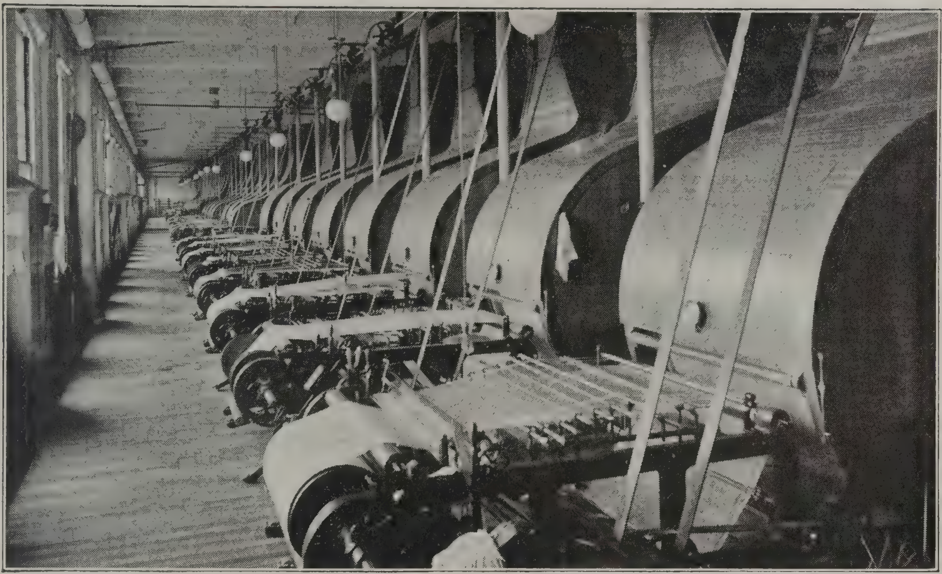


Spoolers

We are now to consider weaving. The first step is to prepare the warp threads. The warp threads are those that extend lengthwise of any fabric. The weft threads cross and intersect those of the warp. Those warp threads have to be the stronger of the two. The ring spinner bobbins are here being wound off on the warper bobbins.

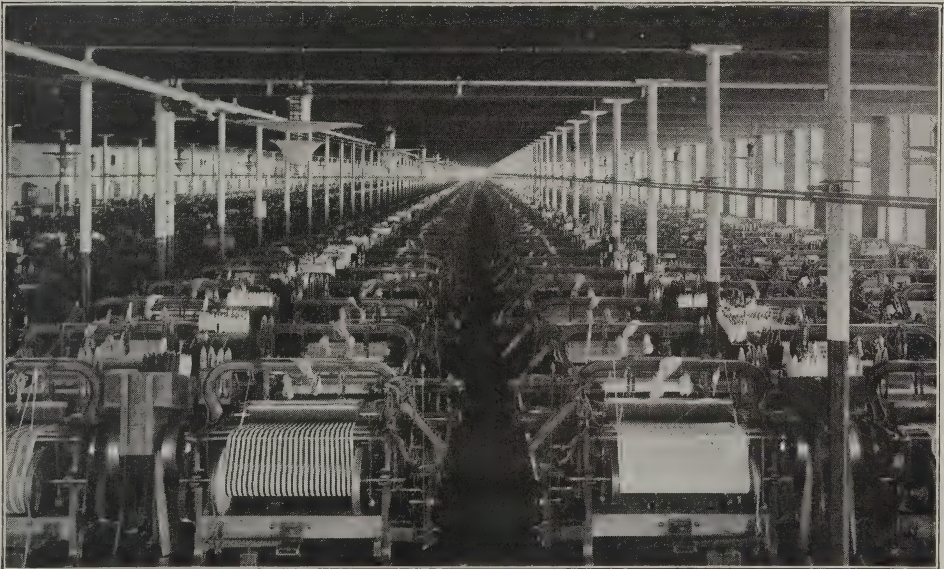
Preparing the Warp

Threads from these warper bobbins are now being arranged for weaving on this large cylinder, or beam.



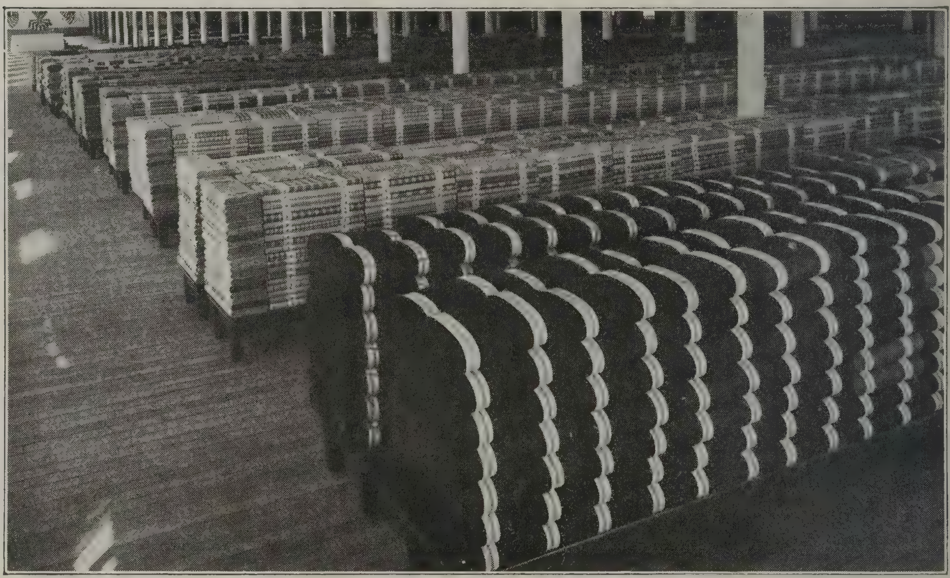
Sizing Machines

Warp threads undergo a special process called sizing. A preparation in the nature of paste is applied to the threads, to strengthen them and to enable them to withstand friction. This is one of the last machines in the process. The warp has been dried in the box-like forms to the right.



Weaving is the final step, and here is illustrated the weaving room of a modern mill. This process is so complicated that it would require far more space than we can devote to it and would require many small illustrations to

make it clear. If you have a piece of cotton cloth with a frazzled edge pick a piece apart. The threads running lengthwise of the piece are the warp threads, those crossing them, now over, then under are the weft threads. Recall the many steps that we have now described by which the tangled mass of lint taken from the cotton bolls are finally arranged as warp threads. In these machines threads from other bobbins are being passed back and forth, over and under, shifting warp threads to form the cloth you hold in your hands. All this has constituted an interesting and instructive story. You have noticed what a marvelous part machinery is playing in this work.



In this illustration, we have the finished product. Notice the bales of cloth, boxed and otherwise ready for shipment. Please turn to the graphic discussion of the New England States. Notice what is said of the development of the Merrimac River. And at Fall River, Massachusetts. "More than two miles of cotton cloth is produced every working minute." You can understand what such a statement implies.

PROJECT METHOD

WHAT IS A PROJECT?

The word project has only recently been adopted as a school term. It comes from the world of business where it is used in such expressions as the "Muscle Shoals Project" or the "Project of a Deep-sea canal from Chicago to the seaboard." From these illustrations we may conclude that a project is a problem, the solution of which will prove highly advantageous. The term has been adopted in educational circles as the name of a series of school activities that—taken together—constitute a forward-step in school methods.

NATURE'S METHOD OF EDUCATION.

On reflection, we see that the project method is the one used by nature in advancing men in culture. Man has won his way by solving problems that brought desired results. To illustrate, men desired to cross rivers, lakes, and seas, or—in general terms—to solve the problem of water transportation. He exerted himself to solve that problem. He began with rude canoes, he made countless improvements, he has ended with palatial ocean liners. The project has been solved, though doubtless further advance will be made. We may say, then, that the project method is Nature's method of educating men.

EDUCATION A PROJECT.

Education of children is a vitally important project and educators are feeling their way to a solution. It is found that the same general methods apply as in other projects, but—naturally—they are modified in accordance with the peculiar nature of the problem to be solved. Some projects are purposely planned to give pupils training along lines not ordinarily considered in school work, though they make for practical education. The Boy Scout movement is such a project—it is an effort to guide the development of boys between the ages of twelve and eighteen years along moral, physical, and patriotic lines. Other projects of a similar nature are mentioned in the articles on "The New Education."

SCHOOL PROJECTS.

School projects, proper, are attempts to so guide the school work of pupils that they shall become familiar with large classes of knowledge—facts that cluster around one central fact, and thus their minds become enriched and they gain worth-while views of large undertakings that were once real projects. To illustrate, the Panama Canal was once a real project of great importance that taxed the science and resources of the nation. Made into a school project, we find that it is the center of a vast mass of facts,—geographical, commercial, scientific, with which we wish the pupils to be come familiar. Such projects abound on every hand. Any worth-while achievement of man—whether making a match or a flying machine—can be made the subject of a school project that will be helpful to children.

THE PROJECT AND THE OUTLINE COMPARED.

Superficially there is a strong resemblance between the project and the outline method of teaching; in reality there is a profound difference. In the outline method we bring knowledge to a focus on the subject we are treating. Let us assume that our subject is coal. We gather and bring to a focus on one central fact—coal—information about coal. The field of view contracts bringing to one point a mass of general information. In the project method, starting with a problem concerning coal as a central fact we branch out into other fields of knowledge to master many knowledge-facts connected with coal. We study some geology, geography, methods of mining, transportation, and study the uses of coal in industry. We are expanding mentally from a central point outwards.

PREPARATION OF THE PROJECT.

The teacher who would make use of the project method, must first select some worth-while subject to consider, one that if she herself were for the first time seeking solution would necessitate research in different fields of knowledge. Having selected her subject she considers the steps necessary to reach a conclusion. Minor points—way station to a solution—constantly present themselves, demanding a solution. Each calls for research in separate branches of learning. Each one is a problem to be solved. To illustrate, suppose we are considering coal. We discover there are different varieties of coal. We must stop and inquire what causes such differences, where are such varieties found, why are they found in such and such localities? These questions are problems to be solved as aids to the solving of the project. The pupils in solving these minor problems must learn somewhat of geography and geology in the primitive long ago.

ARRANGING THE PROJECT MATERIAL.

Having considered the ground to be covered, the teacher arranges in an orderly way the problems and questions that each presents. The result looks like an outline. We have already pointed out the difference. The teacher is preparing to direct the work of her pupils into successive departments of learning, starting from what they already know. The danger is that she will select subjects that make the work difficult for the grades she is teaching. What would be a splendid project for a high school pupil will, quite likely, be of no value to an eighth grade one. The project method is not easy for a conscientious teacher. Her reward comes with the knowledge that her pupils are gaining mental strength, that their mental horizon is expanding, just as travelers enjoy wider views as they ascend.

WORTH OF SCHOOL PROJECTS.

Earnest teachers—those who realize the responsibilities they have assumed in guiding the developing minds of children—see in the project method a foreward step, one affording a new point of view from which to consider the many-sided problem of education. Those who read the signs of the time see in every department of learning evidence that a higher stage of culture is at hand, and regard the project method as making for

the better organized and more practical education that is to usher-in, accompany, and advance that higher culture. It is not assumed that this method is to supersede other approved methods. It is an aid to a clear and orderly arrangement of information and will thus advance the end of all school efforts.

OUR PURPOSE.

Our purpose is to help teachers and pupils to an understanding of, and appreciation of, the project method. We have arranged a number of projects. The busy teacher can not only use them in her school work, but they will serve as models by the aid of which other project exercises can be outlined. Such is the inter-relation of various departments of learning that the countless facts that meet us in daily life can each be made a point of departure from which to sally forth into surrounding fields and gather details of information that shall form a connected whole, enriching the mind of the seekers and lay the foundation of that practical education that the storm and stress of modern life so urgently demands.

THE HOME AND SCHOOL REFERENCE WORK.

It is not out of place in this connection to point out what a wonderful help to teachers and pupils is the "HOME AND SCHOOL REFERENCE WORK" with its stores of information gathered from every department of learning. The figures given refer to the pages in that work where desired information can be found.

MOTIVATION

This word is coming into common use as a school term and the thought it conveys is fundamental in present-day educational methods. It is an idea which has gradually taken shape as the result of the labors of educational writers from the time of Rousseau (page 2489) and Froebel (page 1106), to the present day works of James (page 1491) and Dewey (page 819). The fact that the project method lends itself readily to motivation contributes greatly to the success of that method, and the progressive teacher of today should understand the meaning of the term and know how to apply its principles in her work.

WHAT IS MOTIVATION?

A motive is an incentive to action. No worth-while result is achieved unless there be a motive back of the effort. All human advance is the result of efforts taken under the impelling incentive of motives that appeal to human interests. Education is the result of efforts to fit children for a life of usefulness; in this work three parties participate—the child, the parent, and the teacher. The parents and teacher need no motivation, for they realize the importance of education and are unworthy of their position and calling if not willing to labor faithfully for that end. With the child, however, it is different. Motives for study must be suggested to him.

EFFECTIVE MOTIVES.

In earlier school methods, it was assumed that learning for mental drill, for cultural effects—the assurance given to the child that storing the mind with information would enable him to win more easily what is vaguely called success—was sufficient motive and it was taken for granted that the child would respond to such an incentive with diligent study and consequent advancement; and in accordance with this assurance the "pouring in" process of education was the approved method. But with a clearer knowledge of child psychology, teachers today understand how to employ more effective means to stimulate pupils,—those that appeal to the child's point of view. In general terms, we know that we must start from what is interesting to the child—not what we think should interest him.

ILLUSTRATION.

An illustration will make our meaning clear. In teaching agriculture—for instance—it does but little good to tell the scholars the benefit that such knowledge will be to them or the importance of agriculture. That does not appeal to them and they take but little interest in their studies. But if a corn club be organized and prizes for the most successful crop be offered, the boy's interest in all school studies connected with agriculture is at once aroused. Those studies are motivated for him. That is the value of the Home-School projects described in the "New Education and the Home" (page 4476).

MOTIVATION IN GENERAL.

In general terms, we may say that we can only effectually motivate school branches by starting further instruction from some point of interest that appeals to child life and child experience. In geography—to illustrate—children are not at all interested in information regarding the equator and other imaginary circles of the earth. They are, however, interested in their home surroundings and, starting from such surroundings, we can gradually expand their thoughts to embrace eventually the state, the nation, and the world. Successful project study always starts with what the children already know about the subject, be it trees, birds, flowers, corn, or whatever may be the subject of the project, and enlarges and expands from that point.

THE TEACHER'S DUTY.

The teacher should be on the alert to discover means of motivating properly the subjects she teaches. She can do this only as she appreciates, understands, and sympathizes with the child's point of view. It is vain for her to think that what interests her will also necessarily appeal to the child. All great improvements in educational methods—the kindergarten, Montessori methods, and the project method—have been taken in response to the same line of thought—to make methods in educational work conform to the needs of child life.

THE SOCIALIZED RECITATION

A remarkable teacher in ancient Greece originated a method of instruction that has persisted through the ages. Socrates—for such was his name—taught by cross-examining his pupils. Seated in the market place or walking in the shady groves of Athens, he would draw some citizen into conversation by means of a simple question. Proceeding therefrom logically, step by step, when his aim was to expose some error or establish truth, Socrates would lead the individual to admission after admission until he was hopelessly entangled by contradictions, and the truth became self-evident.

This form of teaching is known as the Socratic method. It has continued for three and twenty centuries as the orthodox method of imparting knowledge. But in the educational awakening of our age, has come an important departure from the question and answer instruction. This new form is known as the Socialized Recitation.

Under the Socialized Recitation, the student, with a kind of social freedom, takes an active part in the recitation. The purposes of this plan are to strengthen the spirit of democracy and to give more exercise to the pupil's own initiative and encourage his thinking.

Fathers and mothers of middle age today recall that during their school days knowledge was gathered almost entirely through the medium of text books and that their class recitations were by the question and answer method. Education meant the acquiring of isolated facts, unimportant in themselves, and not closely connected. The question and answer method of recitation subordinated the child, made him repeat facts in a parrot-like manner, and almost excluded him from the exercise of his functions as a thinking being.

In the socialized recitation, the pupil is encouraged to take the initiative, to think beyond the "dry-as-dust" lines of the text book, and to stamp upon the proceedings his individual view of the matter under discussion. From almost a passive character in the recitation he becomes a positive force and an influence which helps to broaden, to strengthen, and to enrich the benefit to be derived by himself and his associates.

The modern and progressive teacher will conduct a socialized recitation along something like the following lines: The class is in a rather informal and unconventional formation, the teacher being present more as a guide than as an autocratic leader; but above all, as a unit, as each pupil is a unit. The subject of the lesson is kept always in the foreground, but not slavishly followed as to text book or outline; questions from pupil to pupil, from teacher to pupil and vice versa, discussions, arguments, objections, and criticisms are in order, always keeping as close to the subject as possible. Errors, in fact, theory, and deduction, are pointed out. Correlation with other subjects and classes of knowledge, correction of mistakes in judgment, encouragement in freedom of discussion, and finally the reaching of conclusions from facts as they have been presented and brought

forth will achieve the desired results. The teacher is always in the background, but ever present, ready to contribute of her fund of information, in correcting errors which are not apparent to the pupils themselves—to guide, direct, restrain; but not to do the reciting, or emphasize her superior knowledge.

The question will naturally arise as to the advantages and the disadvantages of this departure from the old formality in the recitation. First, and perhaps the most important advantage is the fact that it tends to make investigators of the pupils, leading them to think for themselves and solve their own problems. It brings their minds into sharp contact with facts and strengthens their reasoning powers. As two flints which have lain in the field inert and lifeless for ages produce sparks when clashed together, so do our minds awaken and rise to higher levels when brought into contact with other minds. These "round table" discussions of the school room are training grounds for the conflicts in after years of these boys and girls when, as men and women, they will contest for supremacy in the varied avocations in life; where their success will depend to a considerable extent upon their ability to express themselves, to defend their opinions, to argue pointedly, to think quickly and clearly, and to reason correctly. If in a recitation of this kind only the pupils with initiative assert themselves, the work cannot be said to be a success. Timid pupils must be encouraged to take advantage of their opportunities, to assert themselves and to assume their rightful place in the discussions.

One of the most important duties of the teacher is to restrain those pupils who would be inclined to monopolize too much of the time and attention of the class, and to push forward and stimulate those who are too apt to merely sit by and listen, blending all into a harmonious whole where each shall have equal rights and privileges,—the essence of our democracy. A socialized recitation properly conducted rescues the class from the dull routine of the lecture system, or the dialogue between the teacher and the individual pupil, and makes of it a period of interest devoted to the pursuit of knowledge.

The "Home and School Reference Work" abounds in the additional information necessary to both teacher and pupil and will enable each to carry out his or her part of the program in a way that will be both interesting and instructive and at the same time supply them with that fund of knowledge upon which rests their ability to think and to reason for themselves.

PROJECT EXERCISES

BIRDS

PROJECT: To Study the Construction, the Different Kinds, the Habits of Birds, and their Value to Man.

I. PROBLEM: Learn the parts of a bird.

1. Bill, 304.
2. Wings, 304.
3. Legs and feet, 305.
4. Feathers, 305.
5. Color, 305.

II. PROBLEM: Study the characteristics, peculiarities and the various kinds of birds.

1. Digestion, 303.
2. Molting, 305.
3. Keen senses, 305.
4. Song, 306.
5. Migration, 306, 1842, 2770, 3422, 3424, 3482.
6. Nests, 1983.
7. Divisions of birds, 304.

III. PROBLEM: Of what practical value are birds to man?

1. Insect destroyers, 307, 1450, 3422.
2. Food, 1076, 2339, 4159 to 4174.
3. Eggs, 911, 1076, 3542.
4. Feathers, 1007. The Ostrich, 2125, 145. Eider duck, 916. Egrets, 912.
5. Carrier pigeons, 510.

IV. PROBLEM: How birds add to our pleasure.

1. By their song.
   (a) Warblers, 3422.
   (b) Larks, 1593.
   (c) Linnets, 1647.
   (d) Finches, 1024.
   (e) Canary, 487.
   (f) Cardinals, 502.
   (g) Thrushes, 2883.
   (h) Robins, 2455.
   (i) Blue Birds, 328.
2. Beautiful plumage, 305.
   (a) Humming birds, 1391.
   (b) Pheasants, 2233.
   (c) Peacock, 2191.
   (d) Birds of Paradise, 307.
3. Household pets.
   (a) Canaries, 487.
   (b) Parrots, 2174.

V. PROBLEM: How to attract birds to our homes.

1. Birds as neighbors, 3482, 3483.

VI. PROBLEM: To gather interesting facts about birds.

1. The origin of birds (derived from reptiles) 4248.
2. How fast can birds fly, 3492.
3. Compare wings with wing of airplanes, 24-25.
4. Color of plumage depends on surroundings, 1007, 3537.
5. American Eagle, 882.

VII. **PROBLEM: To gather interesting stories about birds.**

1. "Nature Lessons," 3413, 3421, 3437.

CONCLUSION. Birds are indispensable to the farmer, furnish vast stores of food, contribute in many ways to our enjoyment and in every detail of bodily structure they are interesting objects of study.

HINTS ON MOTIVATION. Let the pupils tell about their pigeons, chickens, poultry and bird houses. Let them tell about bird nests they found; ask them to describe the strange birds they saw in the zoo. Let them talk about their canary or polly.

CORN

PROJECT: To Determine the Importance of Corn in Our Agricultural Life.

I. **PROBLEM: The description of corn, its origin and history.**

1. Description of the corn plant, 706.
   (a) The stem, 706.
   (b) The leaves, 706.
   (c) The roots, 707.
   (d) The flower and ear, 707.
   Compare with wheat.
2. Origin and history of corn, 706, 3624.
3. Varieties of corn.
   (a) Dent corn, 708.
   (b) Sweet corn, 708.
   (c) Pop corn, 708, 3562.
   Is Kafir corn a variety of corn? 1530.
   Where is it raised? 1530.

II. **PROBLEM: Where corn is raised.**

1. Where is corn raised? 708. (See map, page 706, Consult State Graphics 3930-4009).
   (a) The states of the corn belt, 709.
   (b) Other countries:
      1. Europe, 3624.
      2. Asia, 3624.
      3. Africa, 3624.

III. **PROBLEM: How corn is raised.**

1. Cultivation:
   (a) Preparation of the ground, 708, 3627.
   (b) Machinery used, 3627.
   (c) Kind of soil for best results, 708.
   (d) Selection of seed, 709, 3625.
2. What the growing crop must contend with:
   (a) Various diseases:
      1. Smut, 2671.
      2. Rust, 2502.
   (b) Various enemies:
      1. Cut worm, 767.
      2. Chinch bug, 586.
      3. Army worm, 156.
3. The importance of water to the growing crop, 707.

IV. **PROBLEM: The chemical constituents of corn.**

1. What are the principal mineral elements that corn draws from the soil? 3716.
2. How many pounds of nitrogen does the average corn crop draw from the average acre? 3716.

V. PROBLEM: How corn can be improved.

1. Improving the corn crop:
   (a) Corn Club boys, 4147, 4484, 3624.
   (b) Possibilities, 3624.

VI. PROBLEM: Harvesting and marketing corn.

1. Harvesting the crop:
   (a) Cutting and shocking, 709, 713. (See colored plate on page 708, 3628.)
   (b) Husking, 709, 713, 3628.
   (c) Shelling, 709, 713, 3628.
2. Marketing corn.
   (a) From a study of transportation lines determine the importance of Chicago as a shipping center, 573.
      1. A railroad center, 573.
      2. Water transportation, 574.

VII. PROBLEM: To determine the uses of corn.

1. Uses of corn:
   (a) Used directly as a table food.
      1. Green corn.
      2. Canned corn.
      3. Corn flakes.
   (b) Used as food for stock, thus making live stock-raising profitable. (See the corn belt states' graphics and their discussion, 3969, 3972, 3979, 3980.)
2. As a table food, corn furnishes protein, 1058, and thus builds up tissues, 1057.
3. From the kernel are derived:

Hominy, 719.	Syrup, 1184.
Corn meal.	Alcohol, 61.
Corn flakes.	Rubber.
Starch, 2746.	Dextrine.
Glucose, 1184.	Corn oil.

4. From the stalk are derived:
   Ensilage, 710, 4176.
   Paper, 711, 2158.
   Packing for battle ships, 711.
5. From Cobs:
   Fuel.
   Pipes, 711.

CONCLUSION: Considering the many uses of corn and that upon it our vast live stock industry rests, corn is the most important crop in the United States.

HINTS ON MOTIVATION: The best motivation is to have the boys form a corn club, or at least let each one raise a patch of corn on which they are to have the crop or what it will bring. Let them test the seed in the school, 3625, 3627. Let each one tell how much corn he raises on his farm. How he cultivates it. Have them bring specimen of growing corn to school.

SUBJECTS USED IN DEVELOPING THIS PROJECT:

1. Botany. In the description of corn.
2. Geography. Where corn is raised, and in study of transportation lines.
3. Agriculture. Cultivation of corn.
4. Economics. Corn products and its use.

COTTON

PROJECT: To Determine Important Facts About Cotton and Why It Is Such a Valuable Product.

PREPARATION: Let the pupils list articles which are made from cotton and used in the home, sheets, pillow cases, table cloths, towels, etc. What an immense quantity must be needed for all the people. Where does it come from? How is it made?

I. PROBLEM: To learn what the cotton plant is, how it is cultivated, and what part of the plant produces the fibre.

1. The cotton plant. (See colored plate opp. p. 3640, 719.)
   - (a) It is a member of the mallow family, 1755.
   - (b) Other common and well known members of the same family:
     1. Milkweed, 1848, illustrated article 3478, 3481. (See "Treacherous Hostess," 3440.)
     2. Hollyhocks, 1361.
2. Description of the cotton plant, 719.
   - (a) Varieties grown in the United States.
     1. Short staple cotton, 720.
     2. Sea Island cotton, 720, 3953.
   - (b) Where cotton is raised, 721 and map.
3. How cotton is raised:
   - (a) Cultivation, 720. (See colored plate opp. p. 3640.)
4. Enemies the cotton crop has to contend with:
   - (a) Cotton worm, 722.
   - (b) Cotton-boll weevil, 723. (On weevil see 3099.)
5. Important facts about the boll:
   - (a) The boll is the seed capsule of the flower, 719.
   - (b) Compare the cotton boll with the milkweed pod, the white fuzzy mass of the milkweed becomes the cotton fibre in the boll. These fibres adhere to the seed.
   - (c) Compare the cotton fibres and how we obtain them with the linen fibres we obtain from flax, 1646, and the fibres of wool, 3162. The fibres serve a different purpose in each case.
     1. As downy envelope of the seed.
     2. As skeleton form of leaves and plants.
     3. As protection for the animals.
6. Harvesting the cotton, 721.
   - (a) Time of harvesting—After the boll is opened, 3641. Picking by hand, 3641. In the colored plate notice a machine picking cotton. Placed in the field in baskets, 3641.
   - (b) Separating the seed from the fibre—or ginning, 721, 3642.
     1. See cotton gin, 723.
     2. Invented by Eli Whitney, 3125.
     3. The importance of this invention should be noticed. (See 721.) It made cotton raising profitable and greatly cheapened cotton cloth, 722.
   - (c) Baling cotton. Preparing it for shipment, 721, 3642.
     1. Cotton compressor, 3642.

II. PROBLEM: The various steps by which the baled cotton is manufactured into cloth.

1. Transporting the cotton to manufacturing centers:
   - (a) In the New England States. (See graphic discussion of New England States, 3932, 3936, 3938, 1793.) See in same graphics the importance of water power in developing this industry.
   - (b) In the Southern States:
     North Carolina, 3951; South Carolina, 3952; Georgia, 3953. Study also the importance of water power in these states.
   - (c) In foreign countries, 721.

III. PROBLEM: How cotton is manufactured into cloth.

1. See illustrated article on "The Story of Cotton," 3640, 3648. Every step described from the arrival of cotton to the manufacture of cloth.
2. Weaving, 3094.
3. History of cotton weaving, 722; calico, 449; calico printing, 449; mordants, 1914.

IV. PROBLEM: By-products of cotton.

1. Cotton seel oil, 721, 3640.
   1. Used by packing houses to make lard, butterine, oleomargarine, and soap.
2. Cotton seed meal, 3640.

3. Gun-cotton, the basis of many high explosives, 1247, 2670. High explosives as used in modern war. (See "Torpedo," 2908; "bombs," 4109; "hand grenades," 4097.)

CONCLUSION: Considering the many uses of cotton as wearing material, and for articles of household conveniences and comfort, and further considering the vast amount needed to supply the world's needs we conclude that cotton is one of the most important crops raised; in fact our present-day civilization largely depends on it.

WHEAT

PROJECT: To Determine the Importance of Wheat as a Food Product.

I. PROBLEM: To determine the origin and nature of wheat.

1. Describe the wheat plant, 3114.
   - (a) Mention some other members of the same botanical family, 1216.
   - (b) History of wheat, 3114, 3596.
   - (c) The origin of wheat, 3116.
   - (d) Kinds of wheat:
     1. As to structure:
        - (a) Structure of head or bearded, 3114.
        - (b) Bald, 3114.
     2. As to time of sowing:
        - (a) Spring wheat or hard wheat, 3114. Where raised abundantly? 1863, 3115.
        - (b) Winter wheat or soft wheat, 3114. Where raised abundantly? 3115, 1534.

II. PROBLEM: To determine how wheat is raised.

1. Condition of soil and climate most suitable for wheat, 3114.
2. Cultivation of wheat, 3115, 3596.
   - (a) Harvesting wheat, 3115, 3598.
   - (b) Harvesting machinery, 3598, 3599. Compare ancient and modern methods. (See illustrations, 3595.)
   - (c) Threshing the wheat, 2882.

III. PROBLEM: To determine how wheat is marketed.

1. Railroad and water transportation lines to wheat shipping centers.
   - (a) Trace on map transportation lines. Why do such lines move east and west and not north and south?
   - (b) From a study of transportation lines, note the importance of wheat gathering centers for shipping. Minneapolis, Kansas City and Chicago.
   - (c) The use of elevators in this connection, 1208, 3600.

IV. PROBLEM: To determine amount of wheat raised.

1. Quantities of wheat raised and where, 3115. (See map, page 3114.)
2. Describe dry farming in relation to wheat, 865. What part of the United States is dry farming used? 2962.
3. What effect has modern machinery had on raising wheat? 3116.
4. Is it possible to produce new varieties of wheat? 4178. Consider the work of Burbank, 420, 4178, 4263.

V. PROBLEM: To determine what the crop has to overcome.

1. Enemies of wheat:
   - (a) Chinch bug, 586.
   - (b) Army worm, 156.
   - (c) Hessian fly, 1313.
   - (d) Rust, 2502.
2. Climatic considerations, 3114.
3. What has the barberry bush to do with wheat? 243, 2502.

VI. PROBLEM: To determine how wheat exhausts the soil.

1. What mineral elements does wheat extract largely from the soil? 3717. How much nitrogen does an average crop of wheat take from an acre of soil in one year? (Work this from material given on page 3716.)
2. What is nitrogen? 2042.
3. The soil exhaustion is remedied by the use of fertilizers. The use of clover in this respect, 4153, 4154.

VII. PROBLEM: To determine the value of wheat.

1. The value of wheat as food, 1058, 3601.
   Products of wheat:
   - (a) Flour, obtained by the process of milling. (On milling, consult our illustrated article, pages 3601, 3606.) Every process is beautifully illustrated, modern flouring mill is shown in full. The different processes fully illustrated.
   - (b) Middlings, 3605.
   - (c) Whole wheat flour, 3601.
   - (d) Graham flour, 3601.
   - (e) Bran, 3601.
2. Other food products obtained from wheat:
   - (a) Bread, 376. (See our illustrated article on a loaf of bread, 3607, 3612. Every stage of bread making fully illustrated.)
   - (b) Macaroni, 1725.

CONCLUSION: Wheat is one of the most important crops sown.

HINTS ON MOTIVATION: If any of the pupils live on farms, let them tell the class how many acres of wheat on **their** farm, how they prepare the ground, tell about threshing on their farm, what machines they have, etc. Let the girls tell about bread and bring a loaf to school that they made and tell how they made it. If wheat is growing, bring some into the school room. If winter wheat is growing, bring some in and show how it lives in the winter. Discuss whether snow protects the growing crop.

SUBJECTS USED IN DEVELOPING THIS PROJECT:

1. Geography. In locating wheat sections and transportation lines.
2. Agriculture. In the cultivation of wheat, study of agricultural machinery, dry farming.
3. Botany. Description of wheat and diseases, new varieties of wheat.
4. Chemistry. Study of nitrogen.
5. Economics. In the uses of wheat.

SUGAR

PROJECT: To Determine the Importance of Sugar as an Article of Diet.

I. PROBLEM: The principal varieties of raw sugar.

1. Beet sugar, 274, 3573.
2. Cane sugar, 2783.
3. Maple sugar, 2785.

II. PROBLEM: The nature of beet sugar, how and where obtained.

1. The sugar beet, 274, 3573.
   - (a) Cultivation, 3574, 3575.
   - (b) Harvesting, 3577.
   - (c) Extracting sugar from beet, 3578, 3579.
   - (d) The process of manufacturing, 3580, 3583. (Illustrated Articles.)
2. Where the sugar beet is raised (map), 2785.
   - (a) In the United States (map), 2785 and 3973, 3995.
   - (b) From the location of the beet sugar belt what conclusion as to climate?
   - (c) What as to its geological history, 3973, 3949, 3965.
   - (d) Production in Europe (see map), 2785. Generally in Central Europe, 1159. Notice this is the only sugar raised in Europe.

3. Products derived from the sugar beet.
    (a) Sugar, 3584.
    (b) Syrup, 3583.
    (c) Beet pulp, 3586.

III. PROBLEM: The nature of cane sugar—How and where grown.

1. The sugar cane, 2786.
2. The botanical family to which the cane belongs, 1216.
    (a) Important members of that family:
        1. Wheat, 3114.
        2. Corn, 706.
        3. Sorghum, 2786.
        4. Bamboo, 232.
    (b) The three saccharine yielding members of the grass family:
        1. Cane, yielding syrup and sugar.
        2. Corn, yielding syrup, 711.
        3. Sorghum, yielding syrup, 2786.
        (Notice—The juice of the cane, only, will crystalize.)
    (c) Compare the appearance of the cane, corn and sorghum plants.
3. The cultivation of the cane, 2786.
    (a) Where it is raised (see map, 2785).
    (b) Harvesting the cane and manufacture of sugar, 2783. (Illustrated page opposite 2783.)
    (c) Products derived from the juice of cane:
        1. Sugar.
            (a) Brown sugar, 2784.
            (b) Coffee sugar, 2784.
            (c) Granulated sugar, 2784.
            (d) Loaf sugar, 2784.
            (e) Pulverized sugar, 2784.
        2. Syrup.
            (a) Molasses.
            (b) Rum.
        3. By products.
            (a) Fuel.
            (b) Fertilizers.
4. Production outside of the United States.
    (a) The Philippines, 2239.
    (b) Porto Rico, 2323.
    (c) In South Eastern Asia (see map, 2785).

IV. PROBLEM: Maple sugar—How and where obtained.

1. Obtained from maple trees, 2785.
    (a) Description of maple tree, 1770.
2. Manufactured in northeastern United States, 3935.
3. How manufactured, 3587, 3589. Illustrated article.
4. Products.
    (a) Syrup.
    (b) Sugar.

NOTICE: The favorable position of the United States, the principal country in which maple sugar is produced, the only country in which all kinds of sugar are produced.

QUERY: Does this fact account for the further fact that the American people consume more sugar per capita than any other people, 3503, and, further, does this account for the nervous energy of the American people? 1058.

V. PROBLEM: Uses of sugar.

1. Its food value.
    (a) The sugar eating nations, 3503.
    (b) Why children crave sugar, 3503.
2. Its use as a condiment.
3. Its use as a preservative.
    (a) Jams
    (b) Preserves.

4. As a constituent part of food products.
    (a) Cakes.
    (b) Pies.
    (c) Confectionery.
5. Direct products of sugar.
    (a) Candy, 489.

VI. PROBLEM: Products similar to sugar.

1. Honey, 1367.
    (a) Notice, men make sugar; insects make honey.
    (See illustrated article on Honey, 3591-3594.)
    (See also 3550.)
2. Glucose, 1184.
3. Grape sugar.

CONCLUSION: Owing to its high value as a food, a fact to which nature testifies by making all children like sugar, its use in making other foods palatable, and its preserving qualities, we conclude that sugar is a most important article of diet.

SUBJECT OF THOUGHT: Sugar is so important that nature sets men and insects at work making it and its similar product—honey—and she provides sources of supply in a vegetable, a grass, a tree, and nearly all flowers.

CLOVER

PROJECT: To Determine Why Clover Is a Valuable Plant.

PROBLEM: To study the clover to find out why it is a useful plant and how it is used.

1. Source of material:
    THE HOME AND SCHOOL REFERENCE WORK gives abundant data for developing this subject. This question will arise in many schools where children see fields of clover, see and hear about the threshing of the seed, and see the loads of baled hay. They should use an entire plant for study. Teachers should see that the plants are brought cleaned and wrapped in wet papers. Keep the plants fresh while they are being studied.

II. OUTLINE:

1. Where is clover grown? 628, 69, 70, 2623.
2. What are its uses? 628, 629, 70, 4154, 4175, 962.
3. What are the varieties? 4175, 69, 628.
4. The chief characteristics? 628.
5. Bees are necessary to grow red clover, 271, 747.

HIGH POINTS

Attempts to grow red clover in Australia failed until bumblebees were introduced there, 271.

Vermont has selected red clover, the most important species, as the state flower, 1052, 628.

Numerous U. S. government bulletins are devoted to information about the uses of clover, 962.

White clover under the name, shamrock, is the national flower of Ireland, 2623.

A ton of red clover contains 270 pounds of nitrogen extract and farmers, therefore, sow clover and plow it under to enrich worn-out fields, 629.

QUESTIONS

How many species of clover are there? 628.
What kind of clover can be grown by irrigation? 629.
What is French clover? Chilean clover? 71. Dutch clover? 629.
How is the name clover derived? 629.
How do clover and alfalfa resemble each other? 69, 70.
What is ensilage? 962.
What is a silo and how constructed? 4188, 4189, 4190.

RAINFALL

PROJECT: To Study Causes of Rainfall; Its Uses; the Relative Rainfall Areas of the World With Their Direct Relation to Plant Life; and How Man Makes Up For Lack of Rainfall.

Source: HOME AND SCHOOL REFERENCE WORK. See pages as indicated. Also Government publications listed in Home and School bibliography with all leading articles.

I. PROBLEM: Why life follows rain.

1. Plant distribution. All plant and animal life depend on water. (Pages 3080, 1163.) In Asia, 169. In Africa, 30. In Europe, 982. In North America, 2050. In South America, 2696. The valleys of great rivers have always been the most densely populated, 1470.

II. PROBLEM: Why and where rainfall varies.

1. Tropical regions. In general the rainfall is heavier in tropical regions than elsewhere because of the great evaporation, 2399, 622, 623.
2. Heaviest rainfall in the world on the south slopes of Himalayas, 2399. At Cherrapongee, a village in the Brahmaputra Valley, the annual rainfall averages more than 600 inches, 1428.
3. Deserts. Scanty or no rainfall. Dryness due to three chief causes, 813, 814.
4. Semi-arid lands. Area in United States equal to Wisconsin, 1472.
5. Effects of winds, 2399.

III. PROBLEM: What moves the water?

1. Evaporation, diffusion and precipitation, 1390, 627.

IV. PROBLEM: How is rainfall measured?

1. Rain gauge, 2400, 1826.

V. PROBLEM: How man makes up for lack of rainfall.

1. Irrigation, 1470, 913.
2. Dry farming, 865.
3. Artesian wells, 160, 161, 3102.
4. Selection of drouth-resisting crops, wheat, corn, rye, flax, oats, barley, potatoes, sorghum, alfalfa, peas, beans, and in the southland dates and olives, 865.
5. Acclimatization, 10.

MICHIGAN

To Study Michigan's Unique Physical Advantages and Natural Resources in their Relationship to the Manufacturing Developments.

I. PROBLEM: What is peculiar about Michigan's transportation facilities?

1. More shore line than any state, 3972.
2. More than 5000 lakes. No part more than 85 miles from a lake, 3972.
3. Detroit River busiest waterway in world, 1838, 817.
4. Greatest lock in U. S. at Sault Ste. Marie, 1838, 2560, 2561.
5. Many steam and electric lines, 1838.

II. PROBLEM: Study the natural physical resources.

1. Water power.
   - (a) Sault Ste. Marie, St. Mary's River, 3974, 2560, 2561.
   - (b) Grand Rapids, 1211.
2. Iron, 1836, 3973, 1465.
3. Copper, 3973, 1836.
4. Coal, 3973.
5. Lumber, 3973.
6. Salt, 3973.
7. Fisheries, 1837.

III. PROBLEM: What are the principal agricultural products?

1. Fruit, 3973.
2. Michigan leads in lettuce, peas, beans, celery and peppermint, 1837.
3. Sugar beets, 3937, 274.
4. Cereals, grains, 3973, 1837.
5. Live stock, 1837.

IV. PROBLEM: Study the manufacturing industries of Michigan.

1. Detroit center of automobile industry, 816, 1837.
2. Grand Rapids center for furniture and fly paper, 1837, 1211.
3. Muskegon, furniture, 1837, 1947.
4. Flint and Lansing, automobiles, 1837.
5. Shipyards, 1837.

HIGH POINTS

1. Michigan has many characteristics in common with Florida—peninsula state, extensive coast line, many pleasure resorts, extensive fruit growing, fisheries, early history.

2. An interesting comparison can be made between the white pine belt of Michigan, Wisconsin and Minnesota and the yellow pine belt of the South.

3. Kalamazoo is one of the greatest celery centers in the world.

4. In all sections where sugar beets flourish the soil was glaciated.

5. Sufficient power could be developed at "the Soo" to turn every wheel in Michigan.

IRON

PROJECT: To Determine the Importance of Iron in Our Civilization.

I. PROBLEM: What is iron? 1465.

1. Iron is an element, 4253.
2. Iron is a metal, 1824.
3. Pure iron is found in meteorites, 1825.
4. Iron is mined in the form of iron ores, 1465, 1824.
5. Possible origin of iron deposits:
    (a) In igneous rocks forced up from the center, 3973.
    (b) The rusted down remains of the meteoric masses that formed the present frame work of the continent, 4258.

II. PROBLEM: Varieties of iron ore.

1. Red hematite, 1301. Red hematite is principally iron rust, 1465. Consider its formation in great masses mentioned above, 4258, 2134.
2. Magnetite, 1747. How does it get its name? 1747.
3. Iron pyrites, 2377.

THOUGHT QUESTION: Notice the difference between hematite and magnetite in origin. Both consist of iron united with oxygen; the first is iron-rust. It was formed by the action of oxygen on iron in the open, 4258. The second form was formed in nature's laboratory and ejected from interior in igneous rocks, 1747. This difference in origin explains difference in properties.

III. PROBLEM: Where and how is iron ore obtained?

1. In the United States, 1465, 3957, 3965, 3973, 3977.
   Notice: Iron is generally found in very rugged sections of country where the mountains have been eroded and worn down in the long course of ages. In such cases we conclude the iron was formed in nature's laboratory and ejected by volcanic action; but how shall we explain the iron deposits found is western Alabama and in Minnesota? 4258.
    (a) Other countries, 1465.
2. How iron ore is mined:
    (a) Open surface mining, 1857, 3977. Notice illustration Minnesota graphic, 3976.
    (b) Mining, 1856.
3. Transportation, 1465.

IV. **PROBLEM: How iron is manufactured from the ores, 1466.**

1. What determines the location of smelters? 1466.
2. Where are the principal iron manufacturing points? Pittsburgh, 3941; Birmingham, 308; Gary, 1132; Duluth, 871.
3. What factors determined the selection of these cities as iron manufacturing centers?

V. **PROBLEM: Forms of manufactured iron.**

1. Pig iron, the first form, 1466, 319. In this process coke is used. Notice the relation between iron and coal.
2. Wrought iron is manufactured from pig iron, 1466, 1467.
3. Steel, 1468.
    (a) Varieties of steel:
        1. Crucible, 1468, 750.
        2. Bessemer steel, 1468, 293.
        3. Open hearth, 1468, 2104.
        4. Armor plate, 1469, 152.
            (a) Use of armor plate on battle ships, 3060.
        5. Steel alloys, 1469.

VI. **PROBLEM: Why is iron so valuable?**

1. Transportation absolutely depends on it.
    (a) Railroads, 2395.
    (b) Steamships, 2753.
    (c) Automobiles, 211.
    (d) Tractors, 2914.
    (e) Automotive vehicles, 211.
    (f) Airplanes, 24.
2. Modern industry depends on it.
    (a) Steam engines, 2752.
    (b) Electrical motors, 930.
3. Exchange of thought.
    (a) Telegraph, 2839.
    (b) Telephone, 2845.
    (c) Printing press, 2353.
4. Modern science depends on scientific appliances.
    (a) Surgery, 2797.
    (b) Engineering, 956.
    (c) Dentistry, 809.
    (d) Astronomy, 178.

CONCLUSION: Iron is by far the most important metal known. Civilization rests upon it and the present age is known as the Age of Iron. Of recent years between thirty-five and forty million tons of pig iron are produced in the United States yearly.

SUBJECTS USED IN DEVELOPING THIS PROJECT:

1. Chemistry. In considering the nature of iron and its varieties.
2. Geography. In considering the locations where iron is found.
3. Geology. In considering the origin of iron, especially the different varieties.
4. Economics. In considering the transportation and use of iron.

HINTS ON MOTIVATION: Have the pupils name all the articles of iron they can think of. Railroad rails, telegraph and telephone wires, knives, skates, etc. This fixes in their mind the value of iron. If possible get specimens of ore to examine. Get piece of rusty iron to show origin of hematite ores.

COAL

PROJECT: To Determine the Importance of Coal in Industry.

I. **PROBLEM: The origin and nature of coal.**

1. The origin of coal, 631.
2. The name and peculiarity of the geological age when the principal coal measures were formed, 500, 501.
3. The distinctive features of the vegetable growth during that period, 4261.

4. Carbon is the principal constituent of coal, 631. Describe it, 500. What is the name of that form of carbon found in coal? 500.
5. Mention principal stages in the change of vegetable matter to coal:
   (a) Peat, 2193. Its principal production, 2193.
   (b) Brown coal or lignite, 632. Where found abundantly, 3963, 3983.
   (c) Bituminous coal, 631. Where found abundantly? (See state graphics, 3941, 3957, 3965, 3971, 3979, 3980, 3989, 3991.)
   (d) Anthracite coal, 631. Where found most abundantly? 2204, 3995.
   (e) Graphite, 1215, 3519.
6. The principal factor in producing different grades of coal is pressure and heat, 631.
   (a) Show that this is true from location of principal supplies of lignite, bituminous and anthracite coal.
   (b) At Niagara Falls graphite is made from anthracite coal in the electrical furnace, 3943.
7. Comparison of American coal fields and those of other countries, 632. What are the prospects of future industrial life in China?
8. Bituminous coal occupies the middle position between lignite and anthracite, it is by far the most abundant, and most widely distributed. The other two forms are located on the borders of the great bituminous fields,—the northwestern, the western and the eastern borders. From this form a mental picture of the geography of the Mississippi Valley during the coal period, 3973, 3996.

II. PROBLEM: Mining coal.

1. Mining of coal. Every phase of coal mining is beautifully illustrated in our Picture Story of coal, 3613, 3623. It is shown how coal is mined by machinery, by drills, how it is hauled to the mine shaft, elevated, washed, sorted, and how accidents are guarded against and rescue work is done by the government.

III. PROBLEM: To determine the products of coal.

1. Coke, 631, 642. On coke depends our steel and iron industry, 1465.
2. Illuminating gas. Used for heating and lighting purposes. Compare with natural gas, 1966.
3. By-products of bituminous coal:
   (a) Coal tar. The residue after gas has been driven away. From this is obtained:
      1. Carbolic acid, 500.
      2. Creosote, 738.
      3. Dyes, 878.

IV. PROBLEM: To determine the uses of coal.

1. Used directly as a fuel to heat dwellings and small buildings. Used to make steam wherewith large buildings are heated. Also used to generate power where machinery is run in factories, and to generate electricity in power stations used for factory purposes.
2. It is the basis on which transportation rests.
   (a) Railroads, street cars, electrical lines, electricity in most cases generated by the use of coal, 2776, 932.
   (b) It is used to propel steamships on the ocean, lakes and rivers, 2753.

V. PROBLEM: To determine how the energy of coal is liberated.

1. What is energy? 4266, 4254.
2. Liberated by combustion, 664. The chemical union of the carbon and oxygen, 2133.

CONCLUSION: Coal is the life of our modern industrial age. Modern civilization depends on the use of coal. The use of hydro-electrical power is a most important auxiliary to the use of coal. (See Niagara Falls, 2034; Sault Ste. Marie, 2560; Keokuk, 1548.) For this reason water power is called "White Coal," 3933, and various state graphics, 3506.

SUBJECTS USED IN DEVELOPING THIS PROJECT:

1. Geography:
   In the distribution, mining, uses and transportation of coal.
2. Language:
   In reading, spelling, oral reports and composition.
3. Elementary science:
   Geology—in origin of coal and its distribution. Chemistry—in composition of coal and the by-products of bituminous coal.

HINTS ON MOTIVATION: In mining sections this is very easy. In all cases, hold conversation with the pupils about how their homes are warmed. Ask them to bring samples of coal to school. Talk about diamonds in connection with coal, and lead pencils in connection with graphites. Talk about coal as used on railroads, in factories, etc. Thus interest will be aroused and you are ready to proceed.

TREES

PROJECT: To Study the Function of Forests in Promoting National Welfare, and the Distinctive Features of Different Varieties of Trees.

REASONS FOR THIS STUDY: The pupils know about shade trees, fruit trees, and nut bearing trees. They know that nearly all buildings in the country are built of wood; that many town and city buildings are constructed of the same material; and they know that countless articles of furniture are manufactured of wood. It is then of interest and importance to learn about trees.

I. PROBLEM: To determine the general characteristics of trees and their varieties, 2923.

1. Trunks of trees, 2923:
   - (a) Different forms of tree trunks, 3473.
   - (b) Arrangement of branches, 3472.
   - (c) Leaves and their different shapes, 4231.
   - (d) The work that leaves do, 1606, 4232.
     See "Do Leaves Breathe?" 3538. See "Why are Leaves Green?" 3543.
   - (e) Interesting facts about trees:
     "How can you tell the age of a tree?" 3558.
     "How long do trees live?" 3559.
     "How does a tall tree carry water up to its top?" 3493, 2923.

II. PROBLEM: To learn about the different classes of trees.

1. The common fruit trees, belonging to the rose family, 2480:
   - (a) Apple tree, 123.
   - (b) Cherry tree, 565.
   - (c) Peach tree, 2190.
   - (d) Pear tree, 2191.
   - (e) Plum tree, 2278.
2. The common nut bearing trees belong to the walnut family, 3050.
   - (a) Walnut tree, 3050.
   - (b) Hickory tree, 1316.
   - (c) Butternut tree, 434.
   - (d) Pecan tree, 2193.
   - (e) Chestnut tree, 568.
     (This tree belongs to the oak family, 2074.)
3. Compare these two groups of trees:
   - (a) As to blossoms.
   - (b) As to the part of the flower we eat, 4235.
   - (c) Notice the result nature strives to obtain in all cases, 4237.
4. Learn the importance of grafting in these two classes of trees, 1205, illustrated. (See "The New Walnut," 4179.)
5. Products of fruit trees:
   - (a) Cider, from apples, 598, 124.
   - (b) Canned fruit, from all, 490.
   - (c) Brandy, apples, peaches, 371.

6. Care to take of fruit trees:
    (a) Pruning, 2363.
    (b) Spraying, 2733.

III. PROBLEM: To learn about the forests of the United States, 1062.

1. The principal forest trees:
    (a) The pines, 2260, 3474.
        1. Fir, 1028.
        2. Hemlock, 1301, 3416.
        3. Redwood, 2415.
            (a) The evergreen sequoia, 2610.
            (b) Washington sequoia, 2610, 3920.
        4. Cedar, 529.
        5. Larches, 1592.
    (b) Oaks, 2074, 3428.
    (c) Maples, 1770, 3587.
    (d) Willows, 3137.
2. Where our forests are located, 1063, 3996, 4004, 4007, 2963.
3. Care taken by government of the forests, 1063.

IV. PROBLEM: Forest products.

1. Lumber, 1714, 1715. Illustrated.
2. Paper, 2157. (See illustrations.)

V. PROBLEM: Tree Culture.

VI. PROBLEM: To learn about interesting classes of trees.

1. The big trees of California, 3920.
2. The petrified forests of the west, 3914, 3915.
3. The banyan tree, 241.

VII. PROBLEM: To gather stories about trees, 3415, 3416, 3426, 3428, 3437, 3441, 3448, 3449.

TRANSPORTATION

PROJECT: To Learn How Man Solved the Problem of Transportation, and the Importance of Transportation to Civilization.

I. PROBLEM: To learn the methods of primitive transportation, 3571.

(a) Primitive transportation by land, 2919.
    1. Toting, 2920.
    2. By pack animals, 2920.
        (a) Camels for caravans, 462.
        (b) Reindeer in arctic lands, 2420.
        (c) Dogs among the Eskimos, 971.
        (d) Elephants in India, 937. (See illustration opp. p. 641.)
        (e) Horses generally drawing wheeled vehicles, 1374.
        (g) Donkeys, as pack animals, 173, 2920, 3571.
        (h) Cattle, oxen, 525, 2920.

(b) Primitive transportation by water:
    1. Canoes, 492.
    2. Rafts, in lumbering, 1715.
    3. Oar-propelled boats of the Greeks and Romans, 2636.
    4. Junks in China, 1525.
    5. Viking ships, 3027.

II. PROBLEM: To learn modern methods of transportation.

(A) Modern land transportation, 2920.
    (a) The coach, 630, 3571.
    (b) Railroads, 2921, 2395.
        1. Locomotive, 1680.
        2. Equipment, 2397.

(c) Electric railway, 932.
(d) Gasoline propelled vehicles, 1134, 1137.
1. Automobile, 211.
2. Automobile trucks, 211.
3. Traction engine, 2915.
(e) Airplanes, 24.
(B) Modern water transportation:
1. Sailing ships, 2636.
2. Steamships, 2753.
(C) Helps to transportation:
1. Good roads, 2453.
2. Canals, 485.
(a) Erie canal, 969.
(b) Sault Ste. Marie, 2560.
(c) Suez canal, 2782.
(d) Panama canal, 2151.

PROBLEM: What inventors have done to improve transportation.

1. Men whose inventions made railroad operations a success:
   (a) James Watts, invented the first successful steam engine, 3088, 2753.
   (b) George Stephenson invented the first successful locomotive engine, 2760.
   (c) George Westinghouse invented the air brake, thus controlling the movement of the train, 3107, 41.
   (d) George Mortimer Pullman invented the Pullman sleeping car, making travel comfortable, 2369.
2. Men whose inventions made steamship transportation possible:
   (a) Robert Fulton invented the first successful steamer, the precurser of modern ocean transportation, 1110, 2753.
   (b) John Ericsson invented the screw propeller, 967, 2754.
3. Men whose inventions made aerial transportation possible:
   (a) Wright brothers, who made the first successful airplane, 3169.
   (b) Ferdinand Zeppelin, invented the first dirigible airship, 3193, 24.
4. Men who organized railroad systems, 2397.
   (a) Cornelius Vanderbilt, founder of the Vanderbilt system. (Born 1794, died 1877.)
   (b) Jay Gould, founder of the Gould system, 1199.
   (c) Edward Henry Harriman, founder of the Harriman system, 1275.
   (d) James Jerome Hill, founder of the Great Northern system, 1319.

EXERCISE: Compare transportation of various states and countries. See under each article the subhead "Transportation and Commerce."

CONCLUSION: The term "transportation" includes all methods by which men come in contact with each other, exchange products, and learn of each other. These are the most powerful agencies in advancing civilization.

ASIA

PROBLEM: Why commerce and industry have not developed in Asia as in Europe and North America.

PURPOSE: To arouse and create interest in Asia.
To show the relation of physical conditions to the life of the people.
To develop the ability to collect, select, and organize data.
To show through a study of the products, people, and industries, Asia's commercial relations and possibilities in the United States.

OUTLINE OF PROBLEM

I. Location:

1. How does the location of Asia, 167, compare with that of North America, 2048? Of Europe, 980?
2. Does its position aid or hinder manufacturing? Commerce?
3. Why are the people of temperate regions usually the most progressive?

II. Size:

1. How does the size of Asia, 167, compare with that of North America, 2048? Of Europe, 980?
2. Could its size be a disadvantage?

III. Surface features:

1. High in the interior, usually low near the borders.
2. Compare with North America and Europe.
3. Mountains—Himalaya, 1319; Hindu Kush, 1320; Altai, 84; Kuenlun, 1567.
4. Plateaus—Tibet, 2885; Turkestan, 2941; Mongolia, 1895; Pamir, 2150.
5. How do mountains usually affect the mode of living of the people?
6. Are people in mountainous countries more liberty loving than those living on the plains? If so, why? More progressive?
7. Show how the physical conditions of Asia separate the people and affect our problem.

IV. Climate and rainfall.

1. Does the fact that Asia has such a wide range of latitude, longitude, altitude and distance from the sea affect the climate and rainfall? How? Why?
2. In what way are climate and rainfall important factors in the industries of a country? 622, 2399.
3. Why are the rivers of Asia not commercially important? (Hoangho, 1356; Amur, 94; Ob, 2076; Yenisei, 3184; Yangtse-kiang, 3179; Ganges, 1126.)

V. Coast Line.

1. How does the coast line of Asia, 167, compare with that of North America, 2048? Of Europe, 980?
2. Why are the harbors on the North coast closed for several months each year? 167.
3. Who controls many of the harbors on the Eastern coast? 170.
4. Is this an advantage or disadvantage?

VI. People.

1. How does the population of Asia, 170, compare with that of United States, 2966? Europe, 983?
2. What proportion of the world's inhabitants live in Asia? 170.
3. Do the Chinese like changes? 584. What is meant by the worship of ancestors? What is Confucianism? 679.
4. What is the Caste system in India? 1428. How has it hindered progress?

VII. Transportation.

1. Name some of the primitive means of transportation, 2919, 3571, 462, 937, 1374.
2. What is the trans-Siberian railroad? 2919.

VIII. Commerce.

1. What is the open-door policy? 2103.
2. Why is China's trade so valuable to the United States? 584.
3. Why is India so valuable to England? 1427.
4. How does Japan's geographical position give her an advantage in Asiatic commerce over both England and the United States?
5. What was the purpose of the disarmament conference held in Washington? Some of the results?

FROM THE FOREGOING STUDY HOW SUCH CONCLUSIONS AS THE FOLLOWING ARE MADE: ASIA HAS NOT DEVELOPED:

1. **Commerce**—because the continent is so vast that many parts are far from the sea. All parts of a country must have access to the sea to succeed commercially. There are few good roads or railroads; in some sections none. There is only one transcontinental railroad and that has been in operation only since 1901. Considering the size of the continent there are few good harbors and few navigable rivers. This has tended toward separating the people from each other and the rest of the world. The climate has caused the people to settle in the southeastern part of the continent where the fertility of the soil and

abundance of rainfall has favored agriculture. The teeming population has been able to consume the agricultural products and consequently did not feel the need of commerce.

2. **Manufacturing**—because parts of the continent are overpopulated, the people are very poor and uneducated and cannot become skilled workmen. Coal and iron are necessary for industry, and are not mined extensively because of lack of machinery and transportation. Abundance of raw material is needed for factories. The large population demands food products. Water and electric power have not been developed. Hand manufacturing has been sufficient for their needs. Customs change slowly. Worship of ancestors in China, the Caste system in India, and the ways of life in the desert keep the people unprogressive.

JAPAN

PROBLEM: What has enabled so small a country as Japan to become one of the world's powers?

PURPOSE:

1. To give a knowledge of the life and progress of the Japanese people.
2. To show the cause of this progress, and what should be the relations of the United States and Japan.
3. To train the pupils to take the initiative.

PREPARATION: Have the pupils collect pictures of the land of cherry blossoms and chrysanthemums. Organize these pictures somewhat as follows:

1. Surface features.
2. People.
3. Home and street scenes.
4. Industries.
5. Old Japan.
6. New Japan.

The rickshaw is typical of old Japan, the telephone wires of new Japan. (Illustration, page 1492.)

OUTLINE OF PROBLEM

LOCATION:

1. How does the latitude of Japan compare with that of the Mississippi Valley States? 1493.
2. Near what mainland is Japan located? 1492.
3. How has the location contributed to Japan's power?
4. Has nearness to the continent any advantage?
5. Does the fact that Japan lies directly in the sea routes between North America and Asia have any significance?
6. Why does Japan claim the need of a large navy?
7. Is commerce with other nations necessary if a nation is to become great? 666.

SIZE AND POPULATION:

1. How does the size of Japan, 1493, compare with that of the United States, 2958; with Europe, 980; with Texas, 2863?
2. How does the population of Japan, 1495, compare with that of the United States, 2966; Texas, 2863?
3. What can you say of the density of population of Japan as compared with that of the United States or European countries?

SURFACE FEATURES AND COAST LINE:

1. What proportion of Japan is level land? 1493.
2. Are the rivers navigable? 1493. Do they provide much water power? 1493.
3. If a small amount of ground must supply food for a very large population, what must be the methods of farming?
4. Reasoning from the geographical position, what other industry do you think the Japanese might employ to secure food? 1493.

CLIMATE AND RAINFALL:

1. Why do you think Japan has a variety of climate? 1493.
2. Why does Japan have a milder climate than regions with a corresponding latitude in Europe? 1567.

3. What are the most important food crops in Japan? 1493.
4. The most important export? 1493.
5. How is silk raised? (See page 2648, and illustrations, pages 3629 to 3639.)

HISTORY:

1. When may the history of New Japan be said to have begun? 1494.
2. Who was Commodore Perry? 2215.
3. What did Japan gain by the Chinese War in 1894, 1494, by the Russo-Japanese war in 1905, 2501, by the World War?
4. How does their religion affect the fighting qualities of the Japanese? 1494. What is fatalism?

IMMIGRATION PROBLEMS:

1. Why is it absolutely necessary to Japan's existence that she expand into Korea, Manchuria, Siberia, or elsewhere?
2. Why are the people of California so bitterly opposed to the Japanese settling there?
3. What is the "gentleman's agreement" that has existed between the United States and Japan regarding Japanese immigration?
4. What are "picture brides"?

PEOPLE:

1. What are some of the national characteristics of the Japanese? 1493.
2. What is the basic principle of their religion? 1494.
3. Have you ever known or talked with an educated Japanese? If so, what was your impression?

COMMERCIAL:

1. What minerals that Japan needs as a manufacturing country does China have in abundance? 584, 632, 1465.
2. Why are the markets of Asia so important to the World? 169.
3. What is the "Open door policy"? 2103.
4. Name the purpose and give some of the results of the disarmament conference at Washington.

SUMMARY OF PROBLEM:

Japan has become one of the world's powers because:

1. Her position favors commerce.
    - (a) Insular position makes it easy for her to use the sea.
    - (b) In the direct trade route between United States and Asia.
    - (c) Easy access to continent of Asia.
2. Makes use of her natural resources.
    - (a) By means of intensive farming.
    - (b) Maintains productivity of soil.
    - (c) Reclaims waste land and irrigates.
    - (d) Through manufacturing plants.
3. Through contact with western civilization.
    - (a) Quick to grasp new ideas and to imitate.
    - (b) Studies foreign markets.
    - (c) Subsidizes steamboat lines.
4. Education.
    - (a) Sends students to foreign lands.
    - (b) Encourages special training schools.
    - (c) Great proportion (98 per cent.) of children attend school.
5. The government and leading financiers are wide awake, patriotic, and willing to do anything and everything to increase the power and prestige of Japan. Her statesmen and diplomats have proven themselves astute, and with a breadth of vision that is astounding when there is taken into consideration the fact that modern Japan may be said to have only been in existence about seventy years.

SILK

PROJECT: To Learn the Origin of Silk, How It is Manufactured and Its Importance as a Textile.

I. PROBLEM: **To learn the origin of raw silk, 2648. (See colored plate opposite page 3629.)**

1. The silk moth, 2648. (See plate opposite page 3629.)
   - (a) The moth belongs to the Lepidoptera family (1620), to the Insecta (1448). (See p. 1927.)
   - (b) The moth lays the eggs from which the caterpillars or silk-worms are hatched. (See the eggs on colored plate, 2648, 3630. Notice care taken by the Japanese government.) Why is such care taken?
2. The caterpillar or worm stage of the silk-producing insect, 521, 3631, 2648.
   - (a) The silk caterpillar thrives best on mulberry leaves, 1935. (See plate opposite page 3629.)
3. The cocoon. This is the house woven by the worm to serve a home while passing through the pupa stage, 3631.

   It is well at this stage to spend some time on the metamorphosis undergone by the lepidoptera family, 1620. (See "The Flying Cinderella," 3433.) Have the pupils bring the cocoons of various caterpillars. Let them grasp the fact that the first form of silk is just such a cocoon. There is a distant resemblance between the silken home of the cotton-work, the fuzzy cotton fibres of the cotton seed, and the woolly fibres of the sheep's coat. See that they notice it.
   - (a) Compare the tangled, matted silken home of the silk-worm and the open silk-work that the spider spins, 2723. (See "Nature's Spinner," 3443.) The one spins to make a home; the other spins to catch other insects. Considering the wonderfully important use we make of the silk-worm's discarded home, and the extremely important work that spiders do (see "Our Insect Allies," 3433), which is the more important? Suggestions: Let the class decide this by a vote after studying both sides of the question.
4. The history of the production of raw silk, 3629.
   - (a) Where produced in greatest abundance, 2649.
   - (b) What prevents its extensive production in the United States? 2649, 3629.

II. PROBLEM: **How are the tangled threads of the cocoons prepared and woven into cloth.** (See illustrated article, "The Story of Silk," 3629, 3639. See also 2726, 3094, 878.)

1. The center of the silk manufacturing industry in the United States is Paterson, N. J., 2182. In Europe it is Lyons, France, 1722.

COMPARISON: The principal forms of cloth are linen, cotton, woolen and silk. Two are products of the plant world; two of the animal world. In all cases nature furnishes the raw material. We have had to invent methods of preparing the fibres for our use.

TOPICS OF STUDY REQUIRED IN THIS PROJECT:

1. Zoology—In studying the origin of raw silk.
2. Geography—In studying where silk is produced.
3. Industrial Arts—In studying how silk is prepared for use.

PAINTING

PROJECT: Study Painting Through the Stages of Its Advancement in the Important "Schools" of Art; the Masters Who Originated; Points By Which Pictures are Judged; the Practical Materials Used in Painting; and An Analysis of Several Masterpieces of Art.

Source: Home and School Reference Work. See pages indicated.

Note: Here, surely, is a highly specialized project that will test a work of general reference. You will be astonished, we believe, to find how thoroughly this project

can be developed for High School or College Work with no means other than the Home and School Reference Work.

I. **PROBLEM: When did the art of picture making begin?**

1. Primitive art, 1024.
2. Egypt, 4193, 2140, 2141, 1025.
3. Babylonia and Assyria, 2141.
4. Greece, 2141.
5. Rome, 2141.
6. Oriental art, 2115.

II. **PROBLEM: Steps in the development of the art.**

1. Painting was at first an adjunct of architecture—purpose utilitarian—to teach the Bible, 2141, 2142, 1026.
2. Beginning of life-like figures. Cimabue, 2142.
3. "Schools of Art" arose, 2142, 4195, 4196.
4. Accurate representation of form. Florentine School. Giotto di Bondone, 2142, 4200.
5. The expression of sentiment. Sienese School. Duccio. Martini. Lorenzetto Brothers, 2142.
6. Study of perspective. Massacio. Faces first individualized in sacred pictures. Fra Lippi, Linear grace and decorative charm. Botticelli, 2142, 4200, 3028, 3279, 3280.
7. More highly emotional type. Umbrian School. Striking use of human figure. Signorelli, 2143, 2646.
8. Padua School. Mantegna. Dignified, vigorous style, 2142, 1768.
9. Venetian School. Harmonious use of colors. Giovanni Bellini, 2142, 281.
10. Background first used as aid to sentiment. Van Eyck, 2142.
11. Spiritual significance. The colorists. Da Vinci, Michelangelo, Raphael, Correggio, Titian, 2142, 2425.
12. Realism, Holbein. Art in the North, 2143, 2425.
13. Light and Shade. Rembrandt, 2143, 4203, 2422.
14. Flemish, French and English schools, 2143.
15. Modern School in Europe and United States, 2144.

III. **PROBLEM: What points are to be considered in judging a painting?**

1. National influences on art, 4195.
2. Individuality of the artist, 4195.
3. The Subject, 4199.
4. The Drawing, 4200, 3262.
5. Color, 4201, 2140, 654.
6. Light and Shade, 4203, 2422.
7. Composition, 4205.
8. Treatment, 4205.

IV. **PROBLEM: To learn the twelve great paintings, why so called, and to analyze several masterpieces.**

1. The Twelve Great Paintings, 2144, 4202, 4207.
2. The Angelus, 4194, 1850, 102.
3. Gainsborough portrait, 4196, 1119.
4. Murillo's Fruit Venders, 4196, 1940.
5. Rembrandt's Syndics of the Cloth Gold, 4198, 2142.
6. Hals' Laughing Cavalier, 4199, 1262.
7. Turner's The Fighting Temeraire, 4201, 2944.
8. Fildes' The Doctor, 4203.
9. Raphael's Sistine Madonna, 4202, 2404.
10. Ciseri's Ecce Homo, 4204.
11. Corot's landscape, 4206, 715.
12. Di Vinci's Last Supper, 4207, 3028.
13. Breton's Song of the Lark, 4208.

V. **PROBLEM: To study the practical use of materials in painting.**

1. Pastel, fresco, tempera, encaustic, oil, water color, 2140, 1026.

WASHINGTON

PROJECT: To Determine Why Washington Is Held in Such High Esteem by the American People.

PROBLEM: Why do we celebrate Washington's birthday?

In this day of Americanization it is a good idea to make a study of Washington as a typical American—the type we desire to know more about, and to emulate.

1. Explain to the pupils what the word "American" stands for, and what a good American is and does. List these qualities and qualifications on the board in red, white and blue chalk.
2. On one side of this list place an American flag; on the other side a large picture of Washington. Lead the children to see and to tell the ways in which Washington lived up to these requirements.
3. Dramatize George Washington and the cherry tree.
4. Re-tell incidents of Washington's boyhood, 3072.
5. Compose mottoes such as Washington used or might have used, 4659.
6. Tell the story of Betsy Ross and the flag, 4686.
7. Study the flag. For what do the stripes stand? The stars? The Colors? 1038, 4687.
8. Sing the "Star Spangled Banner." Tell who wrote it. Under what circumstances, 1549.
9. Hand work:
   Cut Washington's cocked hat; his sword; his shoe. Make invitations for a George Washington program; hatchets of green or brown paper with red cherries pasted thereon. Write the invitations on the other side. Illustrate, by means of drawing, cutting, or tearing, various incidents in the life of Washington.
10. Picture study:
    Pictures of Washington, 3072; Mt. Vernon, 4658; Martha Washington, Washington's monument, etc., should be used in connection with the foregoing until easily recognized by the pupils.
11. Arithmetic:
    Measure the paper in the making of flags, badges, etc. Drill on the numbers connected with the flag 13 stripes, 7 red, 6 white; the 13 stars of the original flag; who can count the stars on our flag as it is now?
12. Ethics:
    Some lessons we learn from Washington's boyhood—truth, politeness, thoughtfulness, industry, punctuality, neatness, etc.
13. Civics:
    Which would you rather be Lincoln or Washington? Why? 4656.
    Does our country need men like Washington now?
    Will it when you are grown? Why?
    Washington was our first President. Who is President now? 1271.

ARITHMETIC

PROJECT: To Determine the Cost of Furnishing a Dining Room.

PROBLEM: To furnish a dining room complete for a certain sum.

Exercises:

1. Draw a floor plan of your dining room.
2. Indicate the doors, windows, and fixed furniture.
3. Determine the conditions of the floors and walls.
4. Secure paint cards from dealers and work out a color scheme for walls, floor, carpet, and window shades. In selecting a color scheme what things should be taken into consideration?
5. If the floor needs attention, the question of finish must be settled. Figure out the relative cost, durability and attractiveness of oil, paint or varnish finish, or of linoleum.

If the floor is pine, find the cost of filler and two coats of varnish.
If of oak, compare the cost and attractiveness of wax and varnish finish.
To determine the cost, measurements must be made, areas computed, and prices for material and labor secured.
How is varnish made? 3003. Paint? 2140. Linseed oil? 1647.

6. If the room is 14x15 and the rug is 9x12, what is the area of the border?
7. Make a drawing of the floor showing rug in place.
8. Compare the cost, durability and attractiveness of various kinds of rugs—Wiltons, Axminsters, Velvets.
9. Why are rugs preferable to carpets?
10. Compare the cost of the rug if purchased at the local store to prices quoted by mail order houses.
    Take into consideration cost of remittance, freight, and drayage on articles purchased from mail order houses.
11. If cost and quality are equal, do you think that the home merchant should have the preference? Why?
12. If the walls need attention compare the relative cost, durability and desirability of painting, papering and calcimining.
13. Get prices from local dealers on paper, paint, calcimine and labor.
14. How much would you save by doing the work yourself?
    Would the results be satisfactory? In conclusion, determine whether it is advisable to do the work yourself or hire skilled workmen.
15. Choose type of curtains, and compute the amount of material needed and the cost.
16. Select necessary furniture, secure prices, compare prices of local merchants with that of mail order houses.
17. Make a design or monogram for linen.
18. Write an order on your local dealer for the goods.
19. Write a receipt for the goods.
20. Write a check to pay for the goods.
21. Address an envelope for the order.
22. Work out a similar problem for the kitchen, living room, school room.
23. If the amount expended is too much, on what is it best to economize?

AMERICANIZATION

PROJECT: To Determine of What Americanization Consists by a Study of the Development of American Institutions and Analysis of the same.

I. PROBLEM: To trace the development of American institutions.

1. The historical foundation:
   (a) Colony of Virginia.
      1. First English colony, 3034.
      2. Character of settlers, 2972, 1492.
      3. Principal historical character in Virginia, John Smith, 2667.
      4. Introduction of slavery in America, 3035.
      5. First Legislative Assembly in America, 3035.
   (b) Influence of Virginia on the Southern Colonies, 2972-3.
   (c) Influential citizens of early Virginia:
      1. George Washington, 3072.
      2. Thomas Jefferson, 1497.
      3. James Madison, 1740.
      4. Patrick Henry, 1305.
2. The New England Colonies:
   1. Plymouth Colony, 2280.
      (a) Settled by Pilgrims, 2257.
      (b) Formation of the first constitution in America, 2280.
      (c) First public schools in America, 1794.
      (d) Establishment of the first University, 1280.
      (e) Founded the oldest and simplest form of government known —The Town Meeting, 2913, 4370.

(f) Influential citizens of early Massachusetts:
1. John Endicott, 954.
2. John Winthrop, 3147.
3. Roger Williams, 3135.
4. Cotton Mather, 1799.

(g) Influence of Massachusetts on New England, 1794, 1795.

THOUGHT TOPIC: Virginia in the South; Massachusetts in the North, were the centers of influence for their respective centers. Together they molded the characters of the colonies and fitted them for self-government. They shaped early Americanization.

II. PROBLEM: The formation of the United States.

(a) The Declaration of Independence, 797.
(b) Articles of Confederation, 678, 4370.
(c) The Constitution of the United States, 690, 4371.
1. The Constitutional Convention, 691, 4370.
2. The Federalists, 1008.
3. The anti-Federalists, 2298.
4. Principal Amendments:
(a) Slavery abolished, 88.
(b) Prohibition, 2357.
(c) Woman Suffrage, 3156.

III. PROBLEM: To determine American institutions and ideals.

(A) The Government of the United States. General, 1201, 2967, 4370.
1. Legislative Department, vested in Congress, 680, 4371.
(a) House of Representatives, 680, 4371.
(b) The Senate, 681, 4372.
(c) The powers of Congress, 4375.
(d) How a bill becomes a law, 681, 4374.
2. The Executive Department, 4375.
(a) The President, 2344, 2968, 4375.
(b) The Vice-President, 3020, 4375.
(c) How elected, 918, 2344, 4376.
(d) Presidential succession, 2345.
(e) The Cabinet, 438, 4377.
3. The Judicial Department, 2968, 4378.
(a) The Supreme Court, 2796, 4378.
(b) Powers of the Supreme Court, 4379.
(c) Inferior Courts, 4378.
1. United States District Courts, 834.
2. Circuit Courts of Appeals, 603.
4. How the different departments check each other, 4381.
5. Divisions of Government:
(a) School District, 4370.
(b) The Township, 4370, 1201.
(c) The County, 4370.
(d) The State, 4370, 1201.

(B) American Ideals:
1. Republican form of government, 1201.
2. Compulsory education, 669.
3. Religious liberty, 2969.
4. Universal suffrage, 3156.
5. Prohibition, 2357.
6. Freedom of the press, 2346.
7. Equal rights for all, 1201.

IV. PROBLEM: Why is it necessary to instruct immigrants in American principles?

1. The great volume of immigration, 2966.
2. They come largely from Southern European sections where the rate of illiteracy is high, 1423.
3. They are poorly prepared for the duties of citizenship, 604.

4. Nor can they understand the duties they assume when becoming naturalized, 1966.
5. This aid is given in the system of common schools, 669.
   The New Education, 4449.
6. Social Settlement work, 2678.

CONCLUSION: The prosperity of our country, the life of our republic, depends upon an educated, patriotic citizenship. We can not have such a citizenship when the mass of immigrants pouring into our country are ignorant of our history, our institutions, and national ideals.

SUBJECTS Considered in solving this project. History, geography and civil government.

MOTIVATION: By well directed conversation, expand the thoughts of the pupils from their home, school district, town, village, to township, county, state, and nation. Let them see they are but parts of a greater whole.